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MISSION D'APPUI AU PROJET DE DÉVELOPPEMENT DE LA FILIÈRE LAITIÈRE DANS LE BASSIN DE MBARARA (OUGANDA)

Rapport de mission du 7/10 au 17/10/2001

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RÉSUMÉ :

Cette mission d'appui a permis de **rencontrer l'ensemble des responsables des organismes intervenant dans le projet de développement de la filière laitière dans le bassin de MBarara**.

Dans ce rapport, sont présentés :

- La situation actuelle du secteur agricole en Ouganda (« **Plan of Modernisation of Agriculture : PMA** »),
- **Les résultats des propositions suite aux deux enquêtes sur la prévalence de la Tuberculose bovine et de la Brucellose dans le district de MBarara,**
- Les actions entreprises pour **le suivi de la qualité** du lait, en particulier, la mise en place d'un **laboratoire d'analyses du lait à l'Université de MBarara (MUST)**, ainsi que l'appui de la **DDA** et de l'**UNBS**,
- La **nouvelle approche santé publique** et en particulier le problème de l'impact réel de la qualité hygiénique du lait sur la santé humaine (étude conjointe proposée par le **MUST** et le **Joint Clinical Research Center (JCRC),**
- Le compte-rendu d'une **réunion finale d'information** organisée à MBarara par l'association d'éleveurs « **SUMPCA** »,
- **Des propositions pour 2002** dans l'attente du lancement du FSP : ces propositions sont centrées en priorité autour des **volets sensibilisation/vulgarisation, la santé publique, la mise en route effective du laboratoire d'analyse du lait, l'amélioration de l'apport fourrager.**

RÉSUMÉ

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SYNTHÈSE

- Cette mission d'appui, essentiellement auprès de l'Université de MBarara, des Services Vétérinaires et de l'Association d'Eleveurs (SUMPCA) de ce district a permis de rencontrer **l'ensemble des responsables des organismes intervenant dans le projet**, en particulier, l'ACU, le MUST, le MAAIF, l'UNBS, la DDA, le JCRC, la DVO, la SUMPCA, des éleveurs, des « processors » ainsi que l'Ambassade de France en Ouganda.

- Après un bref **rappel des actions conduites par le projet depuis 1998**, les auteurs présentent la **situation actuelle du secteur agricole en Ouganda** et, en particulier, le « **Plan for Modernisation of Agriculture** » **(PMA)**, qui constitue, dans un contexte de **décentralisation**, le programme stratégique du développement rural en Ouganda.

- Dans le domaine de la **santé animale**, **deux enquêtes successives** portant sur l'étude de la **prévalence de la Tuberculose et de la Brucellose bovine** ont permis de mettre en évidence **l'importance de ces deux zoonoses** au niveau du district. Suite à ces deux enquêtes, le **renforcement du volet animation/sensibilisation semble primordial**.

- Cette mission a permis également d'évaluer précisément les actions entreprises pour le **suivi de la qualité du lait** :

  - Un **laboratoire d'analyse du lait a été mis en place à l'Université de MBarara** : ce laboratoire est **considéré comme fonctionnel**, l'approvisionnement en équipements de laboratoire, en consommables ayant été complétés au cours de l'année 2001, deux techniciens ayant été formés à l'UNBS.
  - Ce laboratoire pourra bénéficier largement de **l'appui de la « Dairy Developement Authority » (DDA) et de l' « Uganda National Bureau of Standards » (UNBS).**

- Le constat général d'une « **mauvaise qualité du lait** » a conduit les consultants et les intervenants à se poser le problème en terme de **santé publique** : il apparaît nécessaire **d'aborder, sans tarder, la question de l'impact réel de la qualité hygiénique du lait sur la santé humaine.** Dans ce cadre, une collaboration étroite entre **l'Université de MBarara** (MUST) et le **Joint Clinical Research Center** (JCRC) est envisagée.

- Il est à noter que le « **NARO** » et la **Faculté d'Agriculture** de l'Université de Makéréré **offrent leur collaboration scientifique**.

- **Une réunion finale d'information** organisée à MBarara par la « **SUMPCA** » a réuni les membres de cette association, des représentants de l'Université de MBarara, des Services Vétérinaires et des « processors ». Cet atelier a permis de **présenter les résultats des différents volets du projet** et de **discuter largement pour l'élaboration de propositions.**

- Ce rapport se termine par des **recommandations** dans l'attente du lancement du nouveau FSP, et **afin de poursuivre sans interruption les actions en cours.** Ces recommandations concernent, **en priorité, les renforcement de la sensibilisation des acteurs sur le terrain** (ateliers de formation, campagnes d'information, posters, réédition de brochures de vulgarisation). D'autres recommandations sont présentées autour des actions suivantes :

  - **Lancement en 2002 d'une étude de l'incidence de la tuberculose bovine et de la brucellose chez l'homme,**
  - **Mise en route effective du laboratoire d'analyse du lait** à l'Université de MBarara,
  - **Actions pour l'amélioration de l'apport fourrager** (mission d'appui d'urgence en 2002).

I – RAPPEL DES TERMES DE RÉFÉRENCE DE LA MISSION

1.1. Appui au laboratoire d'hygiène alimentaire de l'Université de Mbarara

- Vérification de la conformité des locaux du laboratoire.
- Vérification de la présence et du bon fonctionnement du matériel de laboratoire mis en place.
- Contrôle des stocks de verreries, réactifs, consommables.
- Proposition de méthodes standards d'analyses physico-chimiques et bactériologiques du lait conformes aux normes internationales.
- Proposition de protocole de recherches et de collecte d'échantillons le long de la filière.
- Vérification du niveau de formation des techniciens ayant suivi le stage à l'UNBS (Kampala).
- Analyse de l'offre de l'Université (quelles analyses peut-elle réaliser, à quel coût ?)
- Mise en place de relations fonctionnelles entre l'Université et :
  - La SUMPCA,
  - Le DVO de Mbarara et le MAAIF à Entebbe,
  - Les industriels laitiers (Mbarara, Kampala),
  - L'UNBS (Kampala),
- Réunion université-clients.
- Analyse de la demande des partenaires potentiels (de quelles analyses ont-ils besoin ?)

Le but est la mise en route effective et immédiate de ce laboratoire qui a largement bénéficié de l'appui de la Coopération française (matériel, consommables, méthodes, formation, missions d'appui…).

1.2. Mission d'appui aux services vétérinaires de Mbarara

Cette partie de la mission aura pour objectifs :

- De présenter à la SUMPCA, aux services vétérinaires et aux décideurs locaux, les résultats définitifs de l'enquête épidémiologique transversale sur la base d'une carte de la situation épidémiologique de départ,
- De décrire les différentes méthodes de lutte contre les deux maladies avec leurs aspects techniques, économiques et épidémiologiques,
- D'informer les acteurs de l'élevage sur les méthodes de lutte,

- De réfléchir à l'équipement nécessaire pour rendre l'unité d'épidémiologie opérationnelle et pérenne,

- De voir dans quelle mesure les résultats obtenus dans le district de Mbarara peuvent s'inscrire dans le Plan national de lutte contre les zoonoses (en partenariat avec l'Agricultural Council of Uganda).

II – DÉROULEMENT DE LA MISSION

Dimanche 7 octobre 2001

- Départ de Paris de C. LE BAS et Jean-Jacques TULASNE le matin à 8 heures : vol international PARIS/ENTEBBE (Via Bruxelles)
- Arrivée à Entebbe à 20 heures, transfert à l'hôtel à Kampala.

Lundi 8 octobre 2001

- Matin :
  - Réunion de travail à Kampala avec Madame Michèle BAHERLE, Conseiller de Coopération et d'Action Culturelle près l'Ambassade de France en Ouganda.

- Après-midi :
  - Réunion au NARO à Entebbe, avec le Dr GADI GUMISIRIZA, Principal Research Officer.

Mardi 9 octobre 2001

- Matin :
  - Entretien au SCAC à Kampala avec le Dr J.J. OTIM, Président de l'A.C.U., en présence de Madame BAHERLE.

- Après-midi :
  - Départ en voiture pour Mbarara. Accueil par M. Christophe MOULIS, CSN au SCAC de Kampala.
  - Préparation de la suite de la mission avec la participation de M. Léonard MUGARURA, ex-chauffeur du projet.

Mercredi 10 octobre 2001

- Matin :
  - Réunion de travail au laboratoire d'hygiène alimentaire de l'Université de Mbarara avec le Pr. ISHARAZA et ses collaborateurs.

- Après-midi :
  - Suite de la réunion du matin.
  - Entretien avec le Révérend Charles BWIRIZAYO, Président de la SUMPCA.
  - Entretien avec Mr Colin SMITH, Directeur d'Agrisystems (UK) et collaborateurs en mission en Ouganda (ADB Meat Production Masterplan).

Jeudi 11 octobre 2001

- Matin :
  - Visite de quatre « collecting center » à Kashaka, Kabwohe et Mbarara.
  - Visite de l'usine « G.B.K. » processor à Mbarara et entretien avec Mr. Henry SENKASI, assistant production manager.

- Après-midi :
  - Visite de l'usine « Country Test », processor à Mbarara et entretien avec Mr. Paul KAFEERO, production manager.
  - Visite de l'usine « Paramount », processor à Mbarara.

Vendredi 12 octobre 2001

- Visite de terrain toute la journée et entretiens avec trois éleveurs du projet :
  - ✓ Mr. Jackson BASI (Kabare – Rubindi)
  - ✓ Mr. Moses MWEBARE (Bwizibwera – Kakyerere)
  - ✓ Mr. James RUTEREZA (Bwizibwera – Kakyerere)

Samedi 13 octobre 2001

- Matin :
  - Réunion d'information suivie d'une discussion au siège de la SUMPCA à Mbarara, sous la présidence du Révérend Ch. BWIRIZAYO, avec la participation du Pr. ISHARAZA, du Dr James DHALWA (DVO Mbarara) et de dix huit éleveurs.

- Après-midi :
  - Entretien avec le Dr James DHALWA (DVO).
  - Dîner avec le Pr. ISHARAZA et le Révérend Ch. BWIRIZAYO.

Dimanche 14 octobre 2001

- Matin :
  - Entretien avec le Dr James Dhalwa (DVO)

- Après-midi :
  - Départ en voiture pour Kampala, arrivée en fin de soirée.

Lundi 15 octobre 2001

- Matin :
  - Réunion de travail au SCAC à Kampala avec M. Christophe MOULIS.
  - Réunion au « Joint Clinical Research Centre » avec le Dr Peter N. MGUYENYI, directeur, le Dr Nathan TWINAMA SIKO, directeur de la DDA et le Pr. ISHARAZA de l'Université de Mbarara.

- Après-midi :
  - Réunion à l'UNBS avec le Dr Ben MANYINDO, Head Technical Operations Department et visite du laboratoire d'hygiène alimentaire.
  - Réunion de travail avec M. Ch. MOULIS au SCAC de Kampala.

Mardi 16 octobre 2001 :

- Matin :
  - Réunion de travail avec M. Ch. MOULIS au SCAC de Kampala.
  - Entretien à la Faculté d'Agriculture de l'Université de Makerere à Kampala avec le Pr. E.N. SABIITI, Doyen de la Faculté et le Dr Joyce KAKURAMATSI-KIKA FUNDA, Head Department of Food Science and Technology. Visite du laboratoire d'hygiène alimentaire de la Faculté.
  - Entretien avec S.E. M. Jean-Bernard THIANT, Ambassadeur de France en Ouganda.

- Après-midi :
  - Réunion à la Dairy Development Authority (DDA) à Kampala avec le Dr Nathan TWINAMASIKO, Directeur, et le Pr. ISHARAZA de l'Université de Mbarara.
  - Entretien à Kampala à la Délégation de la Commission Européenne en Ouganda avec M. Yves GILLET, Conseiller développement rural.

Mercredi 17 octobre 2001

- Matin :
  - Réunion finale de synthèse au SCAC à Kampala, avec Mme M. BAHERLE et M. Ch. MOULIS.
  - Déjeuner à Kampala avec le Pr. KAYENJA, Vice-Chancelier de l'Université de Mbarara.

- Après-midi :
  - Entretien au MAAIF à Entebbe avec le Dr RWAMUSHWA ERASTUS, Directeur des ressources animales.
  - Départ pour Paris : vol international via Bruxelles.

Jeudi 18 octobre 2001

- Arrivée à Paris le matin.

III – PERSONNES RENCONTRÉES

- **Agriculture Council of Uganda (A.C.U. Kampala)** :
  Dr John J. OTIM, Président

- **Mbarara University of Science and Technology (MUST)**

Pr. F. KAYENJA,	Vice-Chancellor
Pr. W.K. ISHARAZA,	Head Biochemistry Department
Dr F. BYARUGABA,	Lecturer (microbiology)
Dr G. KIWANUKA,	Lecturer (biochemistry)
M. M. WESUTA,	Assistant lecturer (biochemistry)
M. J. MWESIGYE,	Lab. Technician (microbiology)
M. NKANGI LWENGA,	Senior Lab. Technician (microbiology)
M. G. MUGABIIRWE,	Lab.Assistant (biochemistry)

- **Faculty of Agriculture (Makerere University – Kampala)** :
  Pr. E. N. SABIITI : Dean
  Dr J. KAKURAMATSI-KIKAFUNDA,Head Department of Food Science and Technology

- **Ministry of Agriculture, Animal Industry and Fisheries (MAAIF – Entebbe) :**
  Dr RWAMUSHWA ERASTUS (Veterinary Services) Director of Animal Ressources

- **National Agricultural Research Organization (NARO – Entebbe)**
  Dr GADI GUMISIRIZA Principal research officer

- **Dairy Development Authority (DDA – Kampala) :**
  Dr Nathan TWINAMASIKO Directeur

- **Uganda National Bureau of Standards (UNBS – Kampala) :**
  Dr Ben MANYINDO Head Technical Operations Department

- **Joint Clinical Research Center (JCRC – Kampala)** :
  Dr Peter N. MUGYENYI

- **Direction of the Veterinary Office – Mbarara (DVO) :**
  Dr James DHALWA Veterinary officer (epidemiology)

- **South Western Uganda Milk Producers Cooperative (SUMPCA – Mbarara) :**
  Révérend Charles BWIRIZAYO Président
  18 éleveurs du projet

- **« G.B.K. » Processor – Mbarara :**
  M. Henry SENKASI Assistant production manager

- **« Country Test » Processor – Mbarara :**
  M. Paul KAFEERO Production manager

- **M. Léonard MUGARURA** Ex-chauffeur du projet (Mbarara)

- **Agrisystems Ltd. (UK) :**
  M. Collin SMITH Directeur

- **Delegation of the European Commission in Uganda – Kampala**
  M. Yves GILLET Rural Development Consellor

- **Ambassade de France en Ouganda – Kampala**
  S.E. Me. Jean-Bernard THIANT Ambassadeur
  Mme Michèle BAHERLE Conseiller de Coopération et d'Action Culturelle
  M. Christophe MOULIS CSN/SCAC

IV – RAPPEL DES ACTIONS CONDUITES PAR LE PROJET DEPUIS 1998

Les activités peuvent se résumer de la façon suivante :

4.1. étude typologique des élevages

Avec identification de **six groupes et de deux grandes tendances** (strates pastorales et agropastorales), allant de l'extensif (autosuffisance) à l'intensification (marché, recherches des profits).

4.2. Amélioration de l'apport fourrager

- Cet apport est un **facteur limitant important pour la production de lait**, surtout pour assurer « la soudure » en saison sèche.

- Des parcelles expérimentales ont été mises en place ainsi que des analyses de pâturages (apport nutritionnel). L'apport en sels minéraux a également été étudié (pierres à lécher).

4.3. Etudes socio-économiques

Ces études ont mis en évidence **d'importantes variations saisonnières de la production et du prix de vente du lait**, ainsi que l'impact déterminant des dépenses en médicaments vétérinaires et de la consommation d'eau sur les coûts de production.

Le problème de la **surproduction et du stockage du lait en saison humide** a été abordé. La production de lait en poudre, de yaourts et de fromages pourrait permettre une régulation des stocks.

4.4. Appui à la santé animale

Deux enquêtes successives ont été conduites en **1999 et 2000**, en collaboration avec les services vétérinaires du district de Mbarara (DVO).

Elles ont permis de déterminer la **prévalence intra et inter-troupeaux de la tuberculose bovine et de la brucellose** au niveau du district, d'éditer et de diffuser largement des **brochures de sensibilisation** à l'attention des éleveurs et des services vétérinaires, et d'aborder **l'impact de ces zoonoses sur la santé publique**.

4.5. Suivi de la qualité du lait

Deux actions prioritaires ont été conduites par le projet :

- **Suivi des mammites** :
  - Au pied de l'animal (test CMT),

- Ce qui a permis d'identifier **l'importance des affections de la mamelle** dans un certain nombre d'élevages,
- **Des brochures de sensibilisation sur l'hygiène de la traite** ont également été éditées et largement diffusées auprès des éleveurs.

➢ **Mise en place d'un laboratoire complet d'analyses du lait à l'Université de Mbarara** ; acquisition de matériel de laboratoire, de consommables et formation de deux techniciens.

4.6. On trouvera l'ensemble des résultats détaillés de ces différentes études dans le rapport « **Mbarara milk project proceedings** » (28-30/11/2000 – Mbarara) rédigé par Julien CHALIMBAUD.

V – COMPTE-RENDU DE MISSION

5.1. Présentation du secteur agricole en Ouganda

➢ Au cours d'une séance de travail, Madame Michèle BAHERLE, Conseiller de Coopération et d'Action Culturelle, et le Dr J.J. OTIM, Président de l' « Agricultural Council of Uganda » (A.C.U.) ont présenté aux consultants les grandes lignes du **« Plan for modernisation of Agriculture » (PMA),** qui représente le programme stratégique actuel du développement rural de l'Ouganda.

➢ L'Ouganda se trouve actuellement dans une **période de transition** devant conduire à un processus de **décentralisation** au bénéfice des **districts.**
Selon le Dr OTIM, « **personne n'est encore réellement prêt** » à jouer son rôle dans le cadre de ce programme.
Le PMA ouvre tous les secteurs de l'agriculture, **de la production à la consommation.** Son but principal est la **lutte contre la pauvreté et les insuffisances alimentaires.** Dans ce contexte, le Gouvernement aura un rôle régalien et de coordination. **Les districts seront libre de mettre en place leur propre plan de développement.**

➢ **Le contrôle des maladies animales restera sous la responsabilité de l'Etat** pour ce qui concerne la **lutte contre les épizooties, les vaccinations, les abattoirs, la législation.** Les vétérinaires privés passeront des contrats avec l'Etat pour la réalisation de campagnes de vaccination, par exemple.

➢ Sur un plan pratique, **tout nouveau projet doit être soumis, pour approbation préalable** à sa mise en œuvre, au « National Advisory Agriculture Delivery Services » (**NAADS**) et au « National Agricultural Research Organisation » (**NARO**) pour les programmes de recherches. Il peut être refusé par ces organismes. On notera que le Pr. F. KAYENJA, Vice-Chancelier de l'Université de Mbarara, est le chairman du NARO. Une fois cette première étape franchie, un projet doit **recevoir obligatoirement l'accord** de l' « Uganda National Council of Science and Technology » (**UNCST**) qui vérifiera, en particulier, qu'il est bien « **PMA compatible** ».

- Le lecteur trouvera en **Annexe 1**, pour son information, les documents suivants :
  - **Brochure de présentation de l'ACU,**
  - **Présentation du PMA (1999),**
  - **Note sur les critères de sélection de projets (PMA),**
  - **Présentation du secteur agricole en Ouganda (en français)**

5.2. Appui à la santé animale

- En **1999 et 2000, deux enquêtes successives** portant sur l'étude de la prévalence inter et intra-troupeaux de la **tuberculose bovine et de la brucellose**, ont permis de mettre en évidence très clairement **l'importance de ces deux zoonoses au niveau du district**. Les protocoles mis en œuvre ainsi que les résultats détaillés et commentés de ces deux enquêtes sont consignés dans les **rapports des stagiaires vétérinaires français et algériens** (Stéphanie DESVAUX, Soumia BOUDJABI, Vincent CASTEL) ainsi que dans le rapport « **Mbarara milk project workshop proceedings** » (28-30/11/2000 – Mbarara), rédigé par Julien CHALIMBAUD.

- Au cours de la présente mission, les consultants ont rendu **visite, sur le terrain, à trois fermiers encadrés par le projet :**

  - Il s'agit de MM. **Jackson BASI, Moses MWEBAZE et James RUTEREZA.**
  - On observe que ces enquêtes ont permis, à l'évidence, de **sensibiliser les éleveurs vis-à-vis de ces deux maladies** : les trois éleveurs visités ont **vendu ou fait abattre sans attendre, les animaux de leur exploitation déclarés** positifs à la suite de l'intradermo-tuberculination, ce qui constitue **un résultat tout à fait positif.**
  - On notera également que ces **éleveurs connaissent l'existence de la relation tuberculose bovine/humaine**, mais, par contre, pratiquement pas, l'aspect zoonotique de la brucellose bovine.
  - **Une question importante se pose immédiatement** : que sont devenus les **bovins positifs à l'intradermotuberculination vendus** pas les éleveurs selon leur déclaration : **ont-ils été abattus pour la boucherie ou revendus ? !** A ce niveau, une **sensibilisation accrue** des éleveurs s'impose.

- **Propositions : le volet animation/sensibilisation est primordial**

  - Les éleveurs sont **demandeurs d'un renforcement de la vulgarisation** pour :
    - ✓ Tuberculose,
    - ✓ Brucellose,
    - ✓ Mammites,
    - ✓ Fièvre aphteuse,
    - ✓ Hygiène de la traite.

  - Ils souhaitent que les « **booklets** » précédemment édités, **soient réédités et largement diffusés** auprès des éleveurs du district.

- **La sensibilisation devra également porter, en priorité, sur :**

  - ✓ **L'élimination impérative vers la boucherie** des animaux positifs à la tuberculination et au test brucellose.,
  - ✓ **La mise en œuvre systématique** par les éleveurs de l'intradermo-tuberculination et de la prise de sang pour le dépistage de la brucellose **lors de l'achat d'un nouveau bovin et avant son introduction dans le troupeau,**
  - ✓ L'intensification de la **vaccination contre la brucellose avec le vaccin S 19** (animaux de moins de 6 mois).

- Ce volet animation/sensibilisation s'inscrit dans le cadre d'un appui que le projet devra continuer à apporter aux services vétérinaires du district pour **la mise en place de stratégies de contrôle des épizooties majeures.**

5.3. Suivi de la qualité du lait

5.3.1. Mise en place d'un laboratoire d'analyse du lait à l'Université de Mbarara (MUST) :

➢ **Techniques réalisées actuellement au laboratoire pour le contrôle de la qualité du lait**

Tests physico-chimiques :
- ✓ organoleptique (odeur, couleur)
- ✓ Ebullition
- ✓ Alcool
- ✓ Lactomètre

Bactériologie :
- ✓ Flore aérobie mésophile totale (FAMT)
- ✓ Coliformes totaux

➢ **Etapes proposées pour l'élargissement progressif des analyses effectuées**

Ces étapes sont une proposition d'évolution progressive du nombre d'analyses réalisées, en fonction des priorités énoncées par les différents acteurs de la filière, tenant compte de tous les aspects de la qualité du lait (qualités sanitaire, nutritionnelle, économique, organoleptique …)

<u>Etape 1</u> : Analyses supplémentaires réalisables immédiatement moyennant l'acquisition de quelques consommables

Bactériologie :
- ✓ Coliformes fécaux
- ✓ E. coli

Sérologie :
- ✓ Test de l'anneau (ring test) pour la recherche de brucellose

<u>Etape 2</u> : Moyennant l'acquisition du matériel et l'extension des locaux ; Analyses représentant une priorité pour la Santé Publique et encouragées par la DDA

Santé publique : diagnostic de la tuberculose : isolement de Mycobacterium (culture bactériologique sur milieu spécifique) et différenciation de M. tuberculosis et M. bovis (PCR, ELISA ?)
Bactériologie :

- ✓ Staphylococcus aureus
- ✓ Salmonella
- ✓ Levures, moisissures

Recherche de résidus (antibiotiques)
Phosphatase, peroxydase

Etape 3 : Analyses à considérer à l'avenir en fonction de besoins spécifiques

Bactériologie (Listeria par ex.)
Spécifiques de certains produits laitiers (clostridies sulfito-reducteurs pour le fromage, par ex.)
Exigences particulières de certains pays importateurs (Métaux lourds, radioisotopes par ex.)
Autres analyses intéressantes à considérer (Acidité Dornic, comptage des cellules, taux de matières grasses, matières protéiques, matière sèche…)

➢ Consommables à fournir pour l'étape 1

- ✓ Cloches du Durham (ex. 6*25mm ; boîte de 500 = 481 FF)
- ✓ Fioles pour culture en verre Wheaton (ex. 8 ml ; 17*70 mm ; 2 cartons de 144 fioles = 2* 774 FF chez Polylabo)
- ✓ Antigènes et réactifs nécessaires pour le Ring test

➢ Normes de référence pour les analyses effectuées

- ✓ Normes de l'UNBS (fondées essentiellement sur des normes ISO)
- ✓ Autres normes s'il n'existe pas de norme UNBS (ex. OIE, FIL, AFNOR…)
- ✓ Les normes disponibles à l'UNBS sont listées en annexe.

➢ Locaux

Le passage d'une étape à l'autre et l'augmentation du nombre d'échantillons traités nécessiteront un agrandissement du laboratoire. Deux propositions sont à considérer :

1- Récupérer une salle de TP pour étudiants, adjacente à la salle actuelle.
2- Utiliser la pièce de stockage des produits chimiques

➢ Personnel

Actuellement, deux techniciens formés à l'UNBS sur les techniques d'analyse du lait et des produits laitiers sont employés par la MUST. Leur travail sur le lait vient en supplément de leurs activités habituelles pour les étudiants de la MUST.

Le Professeur KAYANJA propose d'embaucher 2 techniciens supplémentaires dès que le nombre d'analyse le justifiera.

- **Statut du laboratoire**

Le Professeur KAYANJA suggère que le laboratoire soit indépendant : bien que faisant partie des locaux de la MUST, il devra devenir rapidement autosuffisant par l'intermédiaire des services rendus à ses clients dans le cadre de compétences et d'un personnel qualifié reconnus. La diversité des clients (figure 1) devrait renforcer cette indépendance.

- **Rôle du laboratoire**

  - Laboratoire de référence pour la région de M'barara s'appuyant sur le laboratoire de référence national (UNBS).
  - Contrôle de la qualité du lait le long de la filière (avec comme priorité le contrôle de son rôle dans la transmission de zoonoses comme la tuberculose ou la brucellose) dans la région de M'barara.
  - Appui aux laboratoires d'autocontrôle des transformateurs en vue d'une standardisation et d'un élargissement des analyses réalisées.

- **Clients du laboratoire et leurs besoins**

  - Usines (transformateurs) :
    Ouverture sur de nouveaux marchés
    Appui aux laboratoires d'autocontrôle
    Standardisation des techniques d'analyse chez tous les transformateurs (toutes les usines sont « à égalité »)

  - DDA :
    Dans le cadre du programme de contrôle par le gouvernement du lait cru et transformé. Intérêt d'analyses effectués à tous les niveaux de la filière.

  - Projet FSP :
    Par l'intermédiaire du gouvernement (NADS), la deuxième phase du projet devrait inclure des prélèvements aux différents points critiques de la filière laitières Ougandaise.

Tableau 1 :
Analyses réalisées par les centres de collecte et de transformation du lait dans la région de M'Barara.

	CENTRES DE COLLECTE			TRANSFORMATION		
ANALYSES	Kushaka	Kabwohe	Dairy Cooperation	GBK (UHT)	Countrytaste (pasteurisé, homogénéisé)	Paramount (fromage)
Organoleptiques	•	•	•	•	•	•
Lactomètre	•	•	•	•	•	•
Alcool		•	•	•	•	•
Résazurine		•	•	•	•	•
Bleu de méthylène					•	
Ebullition					•	
Acidité Dornic				•	•	
Densité					•	
Cryoscopie			•			
Matières grasses					•	
Phosphatase				•		
Echantillonnage	Chaque bidon	-	-	-	Chaque tank 1X/jour	Chaque bidon

Figure 1 :
Relations du laboratoire avec ses clients et les institutions

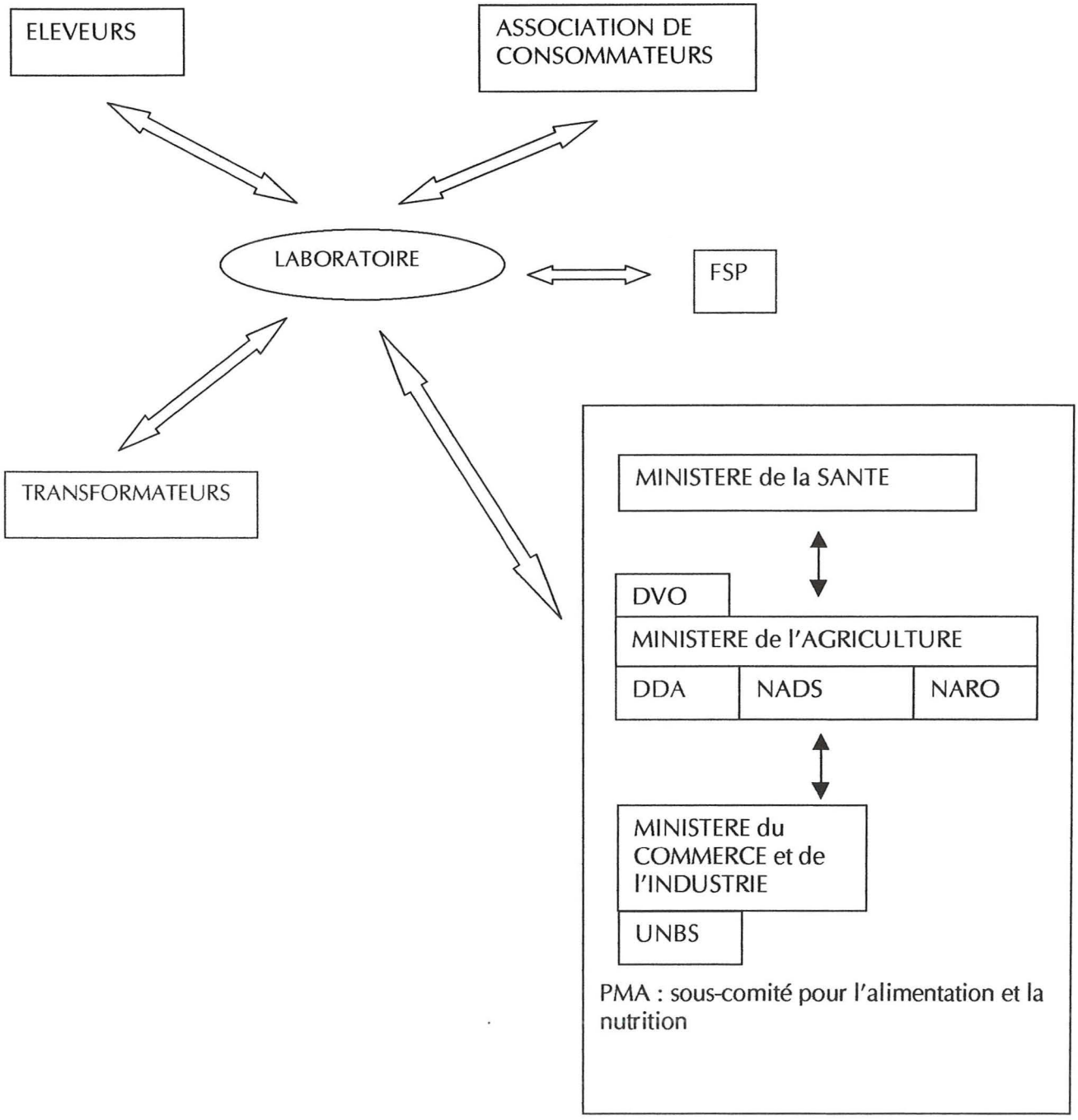


Figure 2
Filière lait en Ouganda, schéma récapitulatif synthétique

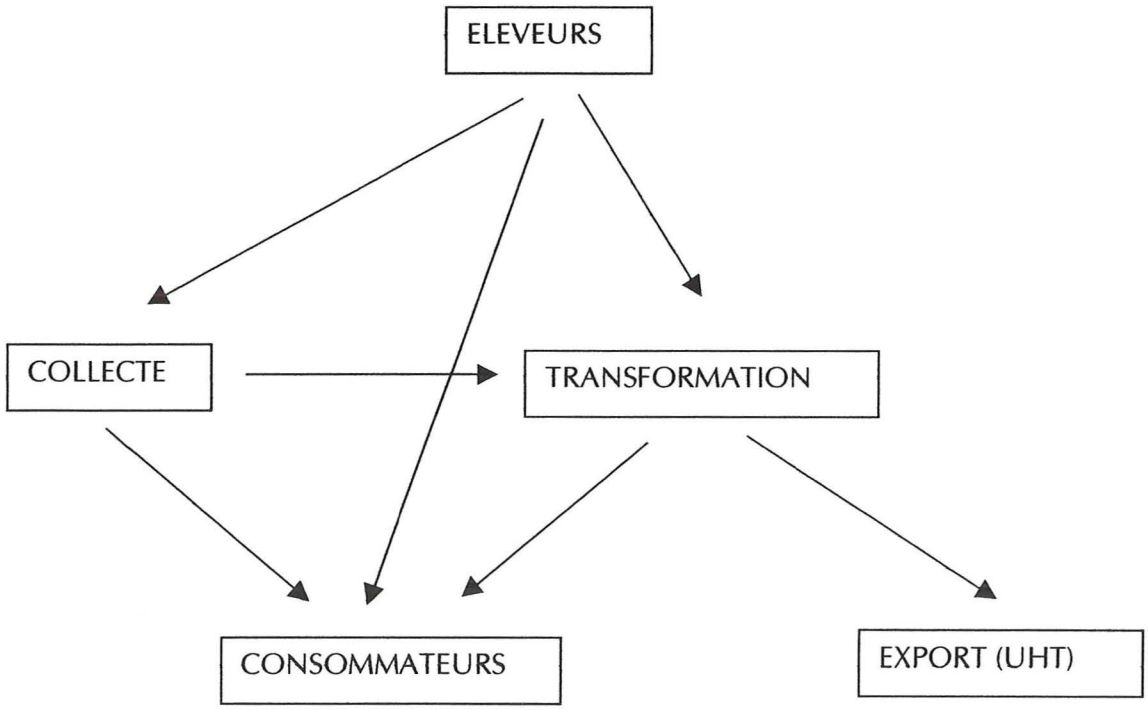
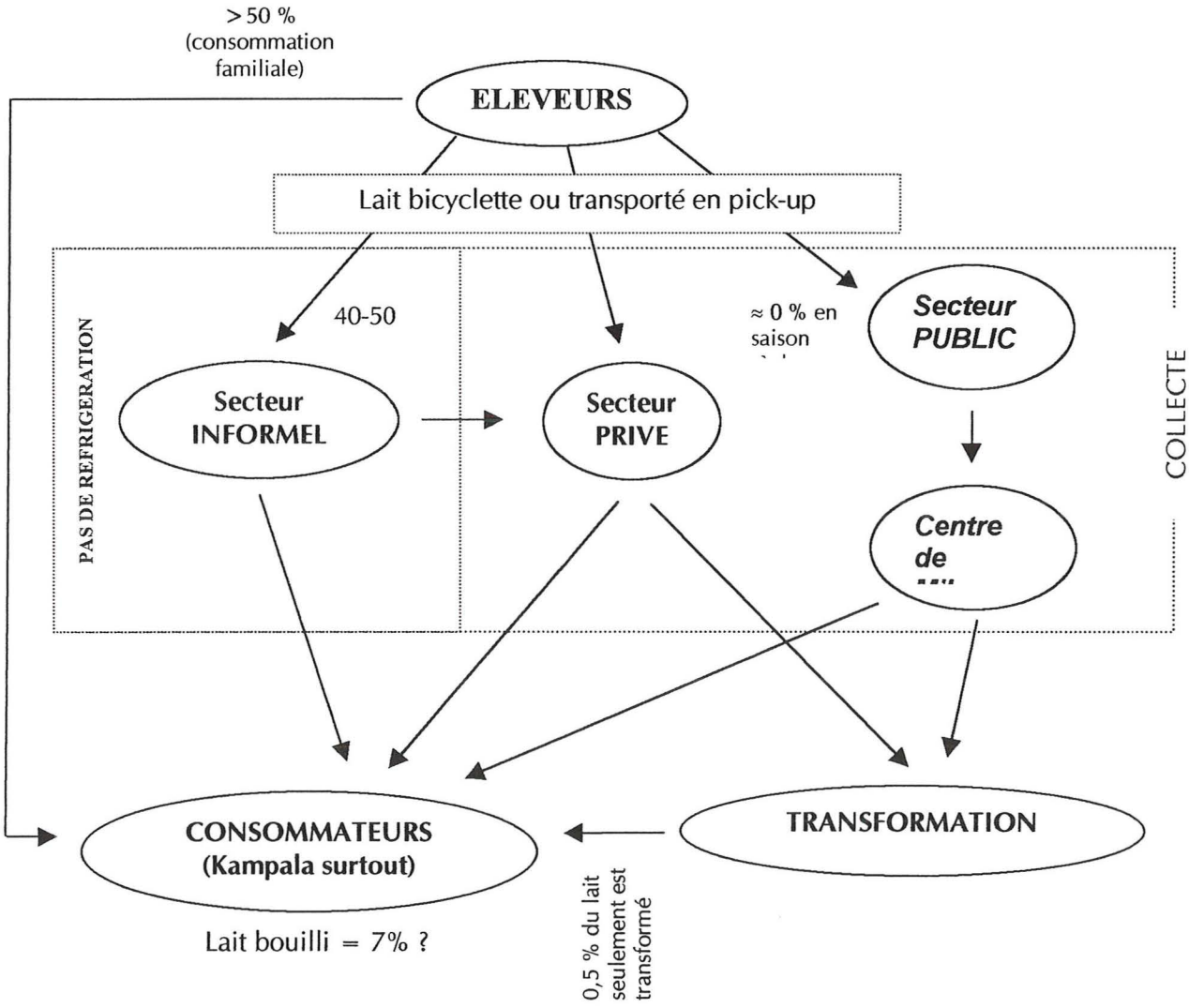


Figure 3 :
Secteurs formels et informels de la filière laitière ougandaise
(pourcentages approximatifs)



➢ Pour information, en **Annexe 2** de ce rapport :

- traduction en anglais par Cédric LE BAS du paragraphe 5.3.1.,
- documents de présentation sur le contrôle de qualité du lait rédigés par le « MUST » (Pr. ISHARAZA et al.),
- « Manual for production of good quality milk » rédigé par « COUNTRY TASTE ».

5.3.2. Appui de la « Dairy development authority » (DDA) et de l' « Uganda National Bureau of standards » (UNBS)

➢ Pour le Dr J.J. OTIM, le laboratoire d'analyse du lait de l'Université de MBarara à un **rôle important à jouer tant sur le marché intérieur qu'à l'exportation**. Il pourrait, d'autre part, devenir **laboratoire régional de contrôle** de qualité du lait (IBAR).
Pour le Dr OTIM, ce laboratoire a **deux objectifs prioritaires** :

- **Contrôle de la qualité du lait** :
  - ✓ Au bénéfice du consommateur national,
  - ✓ À l'exportation.
- **Amélioration de la santé publique** (zoonoses).

Dans ce cadre, la DDA et l'UNBS sont prêts à apporter leur appui technique et normatif à ce laboratoire.

➢ **Dairy Development Authority (DDA) :**

Le Dr Nathan TWINAMASIKO, Executive Director de la DDA a déclaré aux consultants au cours de différents entretiens que **la DDA a besoin, pour mener à bien ses missions, d'un laboratoire d'analyse de la qualité du lait, implanté dans le bassin laitier de MBarara.**
La DDA est donc tout à fait disposée à mettre en place, en collaboration avec l'Université de MBarara (MUST), une **stratégie de suivi et d'amélioration de la qualité hygiénique et nutritionnelle du lait en Ouganda :**

- Le MUST pourrait ainsi devenir **laboratoire de référence** agréé par la DDA,
- La DDA est chargée d'accorder des **licences aux « processors »**,
- Elle peut, dans ce contexte, donner des autorisations au MUST pour effectuer des **prélèvements sur le terrain et chez les « processors »** et est disposée à **payer des analyses,**
- La DDA, d'autre part, souhaite apporter son appui à l'Université de MBarara pour la **création d'un « réseau de compétences »** au sein duquel l'Université pourrait jouer le rôle de coordinateur et de conseiller technique au bénéfice des « processors » pour le contrôle de la qualité du lait produit et transformé,
- Dans ces perspectives, des spécialistes de la DDA se sont rendus à MBarara le 4 octobre 2001 afin de rencontrer les responsables du Laboratoire d'analyse du lait de l'Université, de visiter et d'évaluer cette structure.

On trouvera en **Annexe 3,** copie d'une correspondance adressée par la DDA au MUST (datée du 3/10/2001), un compte-rendu technique préliminaire **non conclusif** rédigé par la DDA, ainsi qu'une brochure de présentation de cet organisme.

➢ **Uganda National Bureau of Standards (UNBS)**

- Cet organisme se déclare **prêt à collaborer avec l'Université de MBarara et la DDA.**
- L'UNBS s'appuie sur le « **Codex alimentarius** » pour la rédaction de standards nationaux.
- Il est convenu **d'utiliser, pour les produits laitiers, les standards UNBS lorsqu'ils existent,** et les standards internationaux dans le cas contraire.
- On notera, par exemple, qu'il n'existe aucune norme en Ouganda pour le contrôle des antibiotiques et acaricides, cette recherche étant l'une des priorités de la DDA.
- On trouvera en **Annexe 4** une liste complète des **standards UNBS pour les produits laitiers.**

5.4. Volet santé publique

➢ **Le problème général de la « mauvaise qualité du lait »** produit et consommé (le secteur informel représentant du moins 50 % de la production !) conduit à se poser le problème en terme de **santé publique (zoonoses).**

➢ L'hôpital de la Faculté de Médecine de l'Université de MBarara observe de plus en plus de **cas de tuberculose et de brucellose humaine**.

➢ **Qu'elle pourrait être l'incidence de la tuberculose bovine (mycobacterium bovis) et de la brucellose bovine chez l'homme ? on n'a aucune réponse claire à apporter à ce sujet.**

➢ Différents entretiens avec les responsables de l'Université de MBarara (MUST), de la DDA, de la Joint Clinical Research Centre (JCRC) ont mis en évidence **la nécessité d'aborder, sans tarder, le problème de l'impact de la qualité hygiénique du lait sur la santé humaine**. L'Université de MBarara et le JCRC de Kampala sont prêts à collaborer sur ce thème. L'Ambassade de France en Ouganda pourrait apporter un appui à ce volet (futur E.S.P.). D'un point de vue opérationnel, la situation est la suivante :

- **Université de MBarara :**
  - ✓ Pourrait assurer la **collecte d'échantillons** (lait, prélèvements chez l'homme) ainsi que le **1er isolement** pour tuberculose et brucellose.
  - ✓ Pourrait réaliser les **Elisa**
  - ✓ Le Pr. ISHARAZA prépare un **document complet** à l'attention du JCRC, de la DDA et du SCAC de l'Ambassade de France présentant le **contexte médical, un argumentaire scientifique, un échéancier, une estimation des besoins et des coûts** (équipements complémentaires, consommables, formations).

- **Joint clinical Research Centre (JCRC) :**
  - ✓ Cet organisme peut effectuer le **diagnostic différentiel tuberculosis/bovis par PCR**, à condition d'acquérir les **primers spécifiques de bovis.**
  - ✓ Le JCRC aura **besoin d'un appui** (à préciser) pour l'extension de locaux et l'acquisition de quelques équipements complémentaires afin de réaliser cette enquête.
    La DDA est disposée à apporter son appui financier.
  - ✓ Dans un deuxième temps, la technique PCR appliquée au diagnostic différentiel tuberculosis/bovis pourrait être transférer du JCRC au MUST, après formation à Kampala.
  - ✓ En ce qui concerne **le diagnostic de la brucellose, aucun laboratoire ne pratique l'isolement de cette bactérie en Ouganda.** Il serait nécessaire d'acquérir quelques équipements de laboratoire complémentaires (étuves, chambres anaérobies), réactifs, primers…
  - ✓ Les consultants ont visité le laboratoire du JCRC pratiquant le diagnostic de la tuberculose humaine. Cette structure, **bien équipée**, travaille en collaboration avec une université américaine. Elle effectue le diagnostic bactériologique, en routine, de *mycobacterium tuberculosis* par isolement et la sérologie en recherche.
    Les responsables de ce laboratoire confirment que **l'extension au diagnostic de *mycobacterium bovis* est tout à fait possible.**

- On consultera en **Annexe 5** un document rédigé par le Pr. ISHARAZA (MUST) intitulé « zoonotic importance of bovine tuberculosis and in HIV/AIDS epidemic in South Western Uganda ».

5.5. Offres de collaboration scientifique

Au cours de leur mission, les consultants se sont entretenus avec des responsables scientifiques du NARO, à Entebbe, et de la **Faculté d'Agriculture de l'Université de Makerere** à Kampala.

Il ressort de ces entretiens que ces deux organismes sont **prêts à collaborer avec le futur FSP sur des thèmes scientifiques à identifier.**

Pour l'information du lecteur, il semble utile de rappeler les domaines de compétences de ces deux organismes.

➢ **National Agricultural Research Organization (NARO) :**

- Son siège est à Entebbe.

- **Trois centres du NARO développement des programmes de recherche sur l'élevage :**
  - ✓ Santé animale (TORORO)
  - ✓ Nutrition et pâturages (NAMULONGE)
  - ✓ Elevage et reproduction (SERERE)

- Le NARO collabore avec les organismes scientifiques étrangers suivants :

- ✓ **DANIDA** : Systèmes d'élevage (TORORO, SERERE, MAKERERE),
- ✓ **DFID** : « Improving livelihood in Eastern Uganda through client oriented research approaches » (SERERE),
- ✓ **AIEA** : outils de diagnostic pour les trypanosomoses (TORORO),
- ✓ **FITCA** : « Farming in Tse-Tse control areas ».

- **Pas de projet financé par l'Union Européenne pour l'élevage.**

- Le NARO fait partie de l'**ASARECA** (Association for Strengthening Agricultural Research in Eastern and Central Africa), qui comprend **10 pays** (Cf. **Annexe 6**).

  L'ASARECA publie un bulletin trimestriel : « **AGRIFORUM** ».

➢ **La Faculté d'Agriculture de l'Université de Makerere (Kampala) :**

Il est intéressant de noter que cette Faculté développe un certain nombre de programmes concernant la filière laitière :

- Bactériologie des yaourts,
- Amélioration de la qualité du lait (en collaboration avec la DDA),
- Développement de nouveaux produits : yaourts, fromages (pour réduire les surplus en saison des pluies),
- Unités pilotes de transformation.

Cette faculté possède un petit laboratoire d'hygiène alimentaire, correctement équipé (analyses physico-chimiques, bactériologie de base).

5.6. Réunion d'information du 13 octobre 2001 organisée à MBarara par la SUMPCA :

➢ Cette réunion d'information, suivie de discussions, était organisée par la « SUMPCA » (**South Western Uganda Milk Producers Co-operative Association**), émanation du projet franco-ougandais de développement de la filière laitière dans le Bassin de MBarara, association créée à l'initiative et avec l'appui du SCAC de l'Ambassade de France en Ouganda (Cf. en Annexe 7 des documents de présentation de cette association).

➢ Cette réunion, d'une durée de quatre heures, s'est tenue au siège de la SUMPCA à MBarara, en présence de **vingt quatre participants** :

- Révérend Ch. BWIRIZAYO, Président de la SUMPCA et Chairman de la réunion,
- Pr. W. ISHARAZA (Université de MBarara),
- Dr James DHALWA (Veterinary Office MBarara),
- A « processor »,
- 18 éleveurs membres de la SUMPCA,
- Dr Cédric LE BAS (Cirad-Emvt),
- Dr Jean-Jacques TULASNE (Cirad-Emvt).

➢ **Programme de la réunion :**

- Introduction par le Révérend Ch. BWIRIZAYO (Chairman)
- Introduction par le Pr. ISHARAZA

- Présentation conjointe des différents volets du projet par le Pr. ISHARAZA et les Drs J. DHALWA, Cédric LE BAS et Jean-Jacques TULASNE : rappels, résultats et propositions
- Discussions, recommandations
- Conclusion par le Chairman

Suivi d'un « pot » avec l'ensemble des participants.

➢ Les interventions du Pr. ISHARAZA, du Dr DHALWA et des deux consultants du CIRAD-EMVT ont suivi le plan suivant :

- **Santé animale et santé publique :**
  - ✓ **Résultats résumés des enquêtes tuberculose et brucellose** dans le district de MBarara : **J.J. TULASNE** (Cf. transparents présentés au cours de la réunion en **Annexe 8**).
  - ✓ Proposition de **stratégies de contrôle de la tuberculose et brucellose bovines : Dr J. DHALWA.**
  - ✓ **Rappels sur la tuberculose et la brucellose humaine** : clinique, épidémiologie : **Pr. ISHARAZA**
  - ✓ **Projet d'étude de l'impact de la tuberculose et de la brucellose bovines chez l'homme** (zoonoses) : **Pr. ISHARAZA**
  - ✓ **Importance du volet vulgarisation : Dr J.J. TULASNE**

- **Laboratoire de contrôle de qualité du lait à l'Université de MBarara**
  - ✓ **Présentation du contexte institutionnel et opérationnel** (appui de la DDA et de l'UNBS), des **objectifs** du laboratoire (contrôle de qualité, « réseau de compétences »), **de la future « clientèle »** (processors, DDA, futur FSP, éleveurs… : **Pr. ISHARAZA**.
  - ✓ **Propositions techniques pour la mise en route du laboratoire** (trois étapes) : Dr C. LE BAS

- **L'avenir immédiat : discussion générale**
  Afin d'assurer la continuité du projet en 2002, dans l'attente de la mise en place d'un FSP, des actions prioritaires peuvent être proposées : discussion animée par le **Dr J.J. TULASNE**.

  N.B. Les recommandations des participants suite à la discussion générale sont **exposées dans le chapitre suivant** (VI).

VI – RECOMMANDATIONS

➢ Il convient, tout d'abord, de rappeler que l'objectif général du projet actuel est **l'identification et l'amélioration des points critiques tout au long de la filière laitière dans le bassin de MBarara, de la mamelle au pack de lait.**

➢ Dans l'attente du lancement du FSP et afin de **poursuivre les actions en cours de sensibilisation des acteurs sur le terrain et ainsi de « maintenir la pression »**, il serait souhaitable que l'Ambassade de France puisse **mettre en place rapidement en 2002 des « budgets relais » afin d'assurer la continuité d'un certain nombre d'actions considérées comme prioritaires.**

- **Santé animale :**

Le Dr Vincent CASTEL, stagiaire vétérinaire français en 2002, présente dans les conclusions de son rapport, des **actions prioritaires à engager sans tarder**.

Il précise, tout d'abord, qu'il serait **illusoire, pour des raisons parfaitement développées dans son rapport, de prétendre éradiquer la tuberculose et la brucellose bovines en Ouganda**. Par contre, un certain nombre d'actions peut être proposé immédiatement afin d'espérer **contrôler** ces deux maladies. Vincent CASTEL et les deux consultants proposent ainsi :

- ✓ **L'organisation d'ateliers de formation et d'information** sous la responsabilité et dans les locaux de la « **SUMPCA** » et avec **l'appui des services vétérinaires du district.** Ces ateliers favoriseraient le contact éleveurs-vétérinaires et permettraient d'améliorer leurs relations.
- ✓ **L'organisation de campagnes d'information au niveau du district par les services vétérinaires**. Sous forme de posters, par exemple. Ces campagnes permettraient de faire passer des messages simples tels que :
  - ⇒ **Incitation au dépistage** des bovins tuberculeux ou brucelliques dans un troupeau,
  - ⇒ **Séparation immédiate** des animaux malades (positifs aux tests) des animaux sains, suivie de **la vente de ces mêmes animaux pour la boucherie exclusivement,**
  - ⇒ Incitation à la mise en place de **tuberculinations** et de **prises de sang** (test EAT brucellose) lors de **l'achat d'un nouvel animal** et avant son introduction dans le troupeau (quarantaine à conseiller).
- ✓ **Dans ce cadre, les services vétérinaires pourraient également** :
  - ⇒ délivrer des certificats individuels pour les animaux contrôlés indemnes,
  - ⇒ encourager **la vaccination des animaux âgés de moins de 6 mois avec le vaccin B 19** : selon le Dr RWAMUSHWA, Directeur des ressources animales au MAAIF, ce Ministère pourrait acheter des stocks de vaccin B 19 et les revendre aux vétérinaires de terrain avec un « discount » de 50 %,
  - ⇒ **prévoir, d'urgence, la réédition des « leaflets »** très appréciés des éleveurs et des vétérinaires, mais épuisés, sur :
    - **l'hygiène de la traite,**
    - **la tuberculose,**
    - **la brucellose.**
  - ⇒ **Réfléchir et proposer des stratégies de contrôle systématique** pour l'extension, **au niveau du district**, des enquêtes déjà réalisées.

- **Santé publique :**

L'étude de **l'incidence de la tuberculose bovine et de la brucellose chez l'homme**, conjointement entre le laboratoire de la MUST (effectuant les prélèvements et les isolements), le JCRC (effectuant la différenciation entre *Mycobacterium tuberculosis* et *Mycobacterium bovis*) et la DDA, proposée par le Pr. ISHARAZA **pourrait être lancé dès 2002** avec l'appui de l'Ambassade de France.

- **Suivi de la qualité du lait :**

Le démarrage effectif du laboratoire de la MUST ayant eu lieu et les techniciens étant formés, le but du laboratoire est maintenant de réaliser des **prestations de services** en vue de son **auto-suffisance et indépendance**. L'extension progressive des analyses se ferait en **trois étapes** :

1. Analyses physico-chimiques et microbiologiques de base y compris la sérologie brucellose (test de l'anneau),
2. Extension selon les priorités de Santé Publique et de la DDA à des tests plus spécifiques,
3. Tests complémentaires selon les demandes des différents clients, dont les processeurs qui pourront formuler des demandes spécifiques à leurs produits, par exemple.

- **Amélioration de l'apport fourrager :**

✓ Cet appui est **très demandé par les éleveurs**.
✓ La mission d'expertise Cirad-Emvt, prévue en 2001 en appui à ce volet, a été supprimée à la demande de l'Ambassade de France.
✓ Il est urgent de **poursuivre en 2002 les essais sur parcelles** pour **diffusion auprès des éleveurs**, accompagnés d'actions de **vulgarisation**.

- **Volet sensibilisation-vulgarisation :**

✓ Tous les éleveurs rencontrés au cours de la présente mission demandent que les **actions de sensibilisation-vulgarisation soient poursuivies et renforcées**.
Ce volet représente pour eux **la priorité** dans les domaines de :
⇒ La santé animale,
⇒ Les zoonoses,
⇒ L'hygiène de la traite,
⇒ L'amélioration de la qualité hygiénique du lait tout au long de la filière,
⇒ L'amélioration de l'apport fourrager.
✓ Comme il a été développé tout au long de ce rapport, la **diffusion des messages** se fera par :
⇒ **La réédition suivie d'une large diffusion au niveau du district des « leaflets » existants** (mais épuisés) :
• Hygiène de la traite,
• Tuberculose,
• Brucellose.
⇒ **L'édition de posters** sur les mêmes thèmes,
⇒ **Des émissions radios**, sur les zoonoses, par exemple (proposition du Pr. ISHARAZA et du Rév. Ch. BWIRIZAYO (Président de la « SUMPCA »).

✓ Ces actions pourraient être conduites à **l'initiative de la « SUMPCA » avec l'appui des services vétérinaires, de l'Université de MBarara**, de l'Ambassade de France et du Cirad-Emvt.

✓ Pour la tenue **d'ateliers de formation**, différents locaux sont disponibles :
- ⇒ Le siège de la « SUMPCA » à MBarara,
- ⇒ Les écoles locales d'agriculture qui possèdent, en général, des « training centers »,
- ⇒ Des fermes « pilotes » pour les démonstrations sur le terrain.

✓ Proposition de trois missions d'appui en 2002 :

Afin d'assurer la continuité des actions en cours, trois missions d'experts Cirad-Emvt sont proposées pour :
- ⇒ **L'apport fourrager (première urgence),**
- ⇒ **La santé animale, santé publique, suivi de la qualité du lait,**
- ⇒ **Une supervision/coordination.**

VII – CONCLUSION :

➢ **Les points forts** de cette mission ont été :

- Le constat d'une très **grande motivation des éleveurs**, en particulier pour leur participation active et très coopérative aux enquêtes de terrain, à la réunion finale d'information organisée par la « SUMPCA », pour leur détermination à éliminer rapidement les animaux atteints de tuberculose identifiés dans leurs troupeaux au cours des enquêtes de prévalence.

- **Le constat, d'autre part, d'une volonté manifestée clairement par l'Université de MBarara** et, en particulier, le Pr. ISHARAZA, **de participer activement** au projet en cours, de jouer un **rôle fédérateur** déterminant, d'apporter son appui scientifique et méthodologique, notamment pour tout ce qui concerne la **santé publique** et le **suivi de la qualité du lait.**

- Le constat également, **d'une demande insistante de la part des éleveurs pour un renforcement du volet sensibilisation/vulgarisation**, notamment dans les domaines de la santé animale, des zoonoses, de l'amélioration de la qualité du lait et de l'apport fourrager.

➢ Cette mission a permis enfin d'identifier un certain nombre de **problèmes « de fond »** tels que :
- ⇒ **Le secteur informel pour la vente du lait est important** : le lait est transporté sur de longues distances sans système de réfrigération et vendu directement aux consommateurs sans transformation, alors que peu de personnes semblent bouillir le lait. Ce problème mériterait une **étude socio-économique approfondie** afin de confirmer ces données et de dégager des possibilités d'action.
- ⇒ **Le milieu vétérinaire local (DVO) manque de moyens** et les répercussions de la privatisation des services vétérinaires est difficile à évaluer. On manque également de vétérinaires praticiens sur le terrain.
- ⇒ **La politique du Gouvernement face aux problèmes de santé publique engendrés par la consommation de lait reste à définir** : par exemple, la part de financement du Gouvernement dans les campagnes de contrôle de la brucellose et de la tuberculose.

VIII – REMERCIEMENTS

Les consultants tiennent à remercier tout particulièrement le **Professeur W.K. ISHARAZA**, de l'Université de MBarara, pour son accueil chaleureux et son assistance permanente tout au long de cette mission, le Président et les membres de la « **SUMPCA** » pour leur excellente collaboration et leur motivation depuis le lancement du projet, **Madame Michèle BAHERLE**, Conseiller de Coopération et d'Action Culturelle près l'Ambassade de France à Kampala, assistée de **Monsieur Christophe MOULIS** pour ses conseils, son appui déterminant et la parfaite organisation de cette mission.

Les consultants tiennent, enfin, à souligner personnellement le **rôle important des stagiaires vétérinaires, agronomes et économistes** qui se sont succédés à MBarara : leurs compétences et leur enthousiasme ont permis des avancées significatives.

ANNEXES

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ANNEXE 1

Présentation du secteur agricole en Ouganda

- ACU
- PMA

(viii) To monitor critically the rapidly changing national/global agricultural and economic environment and provide the bargaining power necessary to mobilise resources for the farming community in timely manner to manage the changes.

(ix) To liaise with NARO, Universities, Private Sector and other related research institutions within and outside the country in the identification of relevant research projects and to ensure effective utilisation of research results by farmers and other stakeholders.

(x) To promote the provision of Advisory Services to farmers and the agricultural industry as a whole by emphasising mutually beneficial linkages.

(xi) To empower National and Apex Farmers' Organisation/ Associations to promote and sustain a culture of saving as a source of sustainable agricultural credit and ultimately strengthen Rural Finance Services.

(xii) To encourage all National and Apex Farmers Organisations/ Associations to address strategic cross-cutting issues such as gender, youth, disabled people etc when promoting the modernisation of agriculture.

❒MANAGEMENT

Currently ACU is being managed by the National Executive Committee under the Chairmanship of the President of ACU, Dr. John J. Otim. The President is assisted by the Vice President.

The Executive Manager assisted by a Secretary/Treasurer and five Chairpersons of the Standing Committees manages the Secretariat. The five Standing Committees are the following:-

- Internal Marketing and Export Promotion Committee.
- Mobilisation, Sensitisation, Documentation and Information Committee.
- Technology dissemination, Research and Development (R & D) and Environmental Protection Committee.
- Social and Political Committee.
- Gender, Youth and Disabled Persons' Committee.

❒CONTACT ADDRESS

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AGRICULTURAL COUNCIL OF UGANDA

"Speaking With One Voice to Fix Solutions"

A C U

Agricultural Council of Uganda

Promoting Agriculture - Led Growth and Rural Livelihood Transformation

❒THE AGRICULTURAL COUNCIL OF UGANDA

The Agricultural Council of Uganda (ACU) is an independent umbrella body set up by stakeholders in Agriculture, in particular National and Apex Farmers Organisations/ Associations, to provide a **Central Forum** where they proactively engage in dialogue and exchange views among themselves on key issues and use the platform to influence agricultural policies for the betterment of farmers and to accelerate growth and poverty reduction through integrated modernisation of agriculture. ACU provides an opportunity for the stakeholders to speak with one voice and enhances their bargaining power when dealing with the Government, Parliament, Development Partners and other Institutions on matters relating to agro-industry and farming community.

❒MISSION OF ACU

The Mission of the Agricultural Council of Uganda (ACU) is to empower National and Apex Farmers Organisations/ Associations and other stakeholders engaged in agro-industry by supporting them to significantly improve their skills, knowledge, capacities and advocacy role with a view to increasing their performance to become effective partners in poverty eradication and agriculture - led growth through an integrated modernisation of agriculture.

❒OBJECTIVES AND FUNCTIONS OF ACU

(i) The main objectives for which the Agricultural Council is established is to empower National and Apex Farmers Organisations/Associations, interest groups and other stakeholders engaged in Agriculture and Agro-related activities to significantly increase their performance in terms of efficient production and adding quality to productivity, processing and marketing.

(ii) To provide a broad participatory framework to analyse Agricultural Policy and technical issues, markets and market information, and national economic policies through an interchange of ideas and experiences amongst Agricultural Council stakeholders, and with Government, Parastatals, Parliament, Academia, Civil Society, Consumers, NGOs, Researchers and any other stakeholders in the agro-industry for the benefit of all.

(iii) To promote co-operation and networking between National and Apex Farmers Organisations/Associations, Consumers Association, industrial and marketing organisations and companies involved in agriculture in Uganda.

(iv) To attend to matters of common interest to the member organisations and companies in such a way that the individual organisations and companies are encouraged to attend to matters which fall within their particular sphere of interest with the ultimate aims of improving and accelerating the modernisation of agriculture.

(v) To act as the joint representative of Uganda's agricultural farming community in matters of common interest involving Farmers Associations/Organisations when dealing with Government, Parliament, the Civil Society and other Ugandan businesses, as well as companies, organisations and institutions outside the country.

(vi) To identify market outlets and conduct marketing promotional activities, as well as determine and co-ordinate the interest of Uganda's farming community within the framework of Regional Corporation including but not limited to regional markets integration.

(vii) To co-ordinate advocacy of Uganda's agricultural policies dealing with questions regarding marketing, financial services crop production, livestock, fisheries, environmental protection, extension services and taxation. ACU shall in addition provide information, encourage training of stakeholders, establish contact with other groups in society and to attend to such other matters and activities as the Council sees fit.

GOVERNMENT OF THE REPUBLIC OF UGANDA

THE REPUBLIC OF UGANDA

PLAN FOR MODERNISATION OF AGRICULTURE: ERADICATING POVERTY IN UGANDA

(Government Strategy and Operational Framework)

EMERGING ISSUES AND POLICY OPTIONS.

(Draft, November, 1999.)

Ministry of Agriculture, Animal Industry and Fisheries
P. O Box 102,
ENTEBBE

Ministry of Finance, Planning and Economic Development
P . O Box 8147,
KAMPALA

PLAN FOR MODERNISATION OF AGRICULTURE

I. VISION:

"A profitable, competitive, sustainable and dynamic agricultural and agro-industrial sector."

II. MISSION:

"To transform subsistence to commercial agriculture through improved service delivery, rapid technology uptake and information flow"

III. TARGET GROUPS:

There are about three broad categories of farmers in Uganda, namely:

1- Commercial farmers (about 5%).

2- Semi-Commercial smallholder farmers (about 25%) and

3- Subsistence farmers (about 70%).

The characteristics and possible public sector interventions for the farmer categories are presented in Table 1. The Plan for Modernisation of Agriculture (PMA) policies and programmes will benefit all the three categories of farmers. However, commercial and semi-commercial farmers will benefit from the policies, infrastructure and a conducive regulatory framework in support of the PMA while public sector investment programmes will be aimed at the majority of the subsistence farmers.

Delivery of public funded intervention programmes will be guided by the principle of ensuring efficiency, effectiveness and performance, and by the "public good " criterion.

The PMA will transform the agricultural sector through increased uptake of productivity enhancing technologies leading to increased production for domestic consumption and surplus for the market. It is envisaged that over the next twenty-five years, half of the subsistence farmers would become commercial farmers.

Table 1. **FARMER CATEGORIES, CHARACTERISTICS AND NEEDED PUBLIC SECTOR INTERVENTIONS.**

Farmer Category	Characteristics	Needed Interventions
Commercial Farmers (5%)	• Possess critical skills and knowledge. • Engage in few but economically viable enterprises. • Have access to local and international market information. • Use high input / high output technology. • Highly specialised in production and processing. • Produce purely for market. • Produce crops and process products for cash. • Have access to and capacity to use risk management instruments.	1. Security of person and property. 2. Stable macro-economic environment. 3. Market Infrastructure (information, storage facilities, etc.). 4. Access to domestic, regional and international markets. 5. Efficient and stable banking services. 6. Legal and regulatory services including contract enforcement established grades and standards for products. 7. Good infrastructure (roads, energy and telecommunications).
Market Oriented Farmers (25%)	• Produce both for home consumption and market. • To some extent use improved methods of production. • Yields are still low. • Partial risk takers. • Produce both food and non-food cash crops	1. Access to market information including 2. Efficient and reliable Inputs delivery systems. 3. Access to problem-solving technologies and agro-processing services. 4. Skills development and access to credit.
Subsistence Farmers (70%)	• Produce mainly for home consumption. • Rely on low input /low output technologies • Rely almost entirely on family labour. • Low skills and knowledge levels. • Small holdings (less than 2 hectares) • Insufficient trade (due to poor roads, small, unreliable and non-competitive products and market information). • Low yields leading to low incomes	1. Positive attitudes and aspirations. 2. Skills development and access to knowledge. 3. Access to technologies - (high yielding, labour saving, disease and pest resistance, etc). 4. Involvement in development activities / good governance. 5. Access to market information and output markets. 6. Access to rural financial services for savings, credit, remittances, pensions. and insurance.

IV. EMERGING CONCERNS AND POLICY OPTIONS FROM THEMATIC AREAS

4.1 AGRICULTURAL RESEARCH AND DEVELOPMENT

Vision:

" A farmer responsive research system that generates and disseminates problem-solving, profitable and environmentally sound technologies on a sustainable basis".

Mission:

"Generation, adaptation and dissemination of appropriate and demand driven technologies , knowledge and information through effective, efficient, sustainable, decentralised and well co-ordinated agricultural research system".

Research Issues:

1. Involvement of farmers in the prioritisation, implementation, testing and impact assessment of research.

2. Technologies not adequately tested and demonstrated under farmer circumstances.

3. Inadequacy of technology delivery systems including weak linkages with agro-processing, and input and output markets.

4. Dissemination of technologies without complementary packages/inputs leading to poor farm level performance.

5. Limited socio-economic input in technology assessment and selection.

6. Limited scope of farm power and post-harvest technologies.

   Consequently, less than 30% of the subsistence farmers use improved seed, less than 10% practice any form of plant protection, there is practically no use of fertilisers or any form of soil and water amendment, and on farm yields are at less than 30% research station yields.

7. Many players in the research system operating independently, with minimal co-ordination and without a comprehensive policy to guide them.

Strategic Recommendations:

4.1. Government should develop a comprehensive policy on agricultural research and extension to guide all players.

4.2 Institutional assessments and functional analyses should be carried out for research institutions to help in planning, capacity building and assigning appropriate roles and mandates.

4.3 Stakeholders should be involvement in priority setting, planning, implementation and evaluation of research.

4.4 Socio- economics should be institutionalised in the research programmes to provide inputs in needs assessment, technology evaluation, adoption studies and impact assessments.

4.5 Government should withdraw from areas where the private sector can play an effective role; contract the private sector to undertake selected public funded research activities; put in place appropriate laws including intellectual property rights; and provide tax and non-tax incentives for private sector involvement in research.

4.6 Decentralise research to ecological zones and districts through Agricultural Research and Development Centres (ARDCs) to deepen stakeholder participation and enhance efficiency and effectiveness.

4.7 Linkages and collaboration should be strengthened with national, regional and international agricultural research centres to take advantage of technologies already generated and avoid duplication of effort.

4.8 Sustainable financing mechanisms including lease of excess facilities including land and buildings; sell of research products (seed, semen, timber, fish fry, etc) and sell of services including soil analysis and disease diagnosis services should be explored.

4.2 AGRICULTURAL EXTENSION

Vision:

"Decentralised, farmer owned and private sector serviced extension contributing to the realisation of the agricultural sector objectives."

Mission:

"Increased farmer access to information, knowledge and technology through an effective, efficient, sustainable and decentralised extension with increasing private sector involvement in line with government policy."

Extension Issues:

1. Increasing the effectiveness, efficiency and sustainability (including financing, private sector participation, farmer responsiveness, deepening decentralisation, gender sensitivity) of the extension delivery service.

2. Increasing farmers' access to and sustaining knowledge (education), information and communication to farmers.

3. Increased access to and sustaining effective and efficient productivity enhancing technologies to farmers.

4. Aligning extension to government policy particularly privatisation, liberalisation, decentralisation and democratisation.

5. Creating and strengthening linkages and co-ordination within the overall extension services.

International Experience:

1. There have been positive experiences with privatisation and commercialisation of extension in many countries.

2. Decentralisation of extension service delivery can lead to increased funding and staffing including increased contribution by local governments.

3. Decentralisation and increased private sector involvement (delivery and financing) leads to greater efficiency and effectiveness of delivery of extension services.

Policy Recommendations:

1- Deepen the decentralisation of extension delivery to district and sub-county levels.

2- Pilot options for the delivery of extension services with the view to divest public funded services to the private sector over the next five years.

3- Explore options for increasing the contribution of the private sector to the financing of the extension services.

4- Establish an Agricultural Development Fund (ADF) at district and sub-county levels for resource mobilisation in support of Agricultural Extension.

5- Establish Technology Development Centres (TDCs) and Agricultural Development Centres (ADCs) at sub-counties and districts, respectively as avenues for providing decentralised farmer training centres, information access, technology demonstrations and testing.

6- Establish zonal Agricultural Research and Development Centres (ARDCs) under NARO to enhance farmer training, access to information, technology testing, adaptation and feedback.

7- MAAIF to provide the extension policy, set extension standards, monitoring regulations, provide technical backup, guidance, inspection and co-ordination and monitoring and evaluation services.

4.3 RURAL FINANCE

Vision:

"An efficient, integrated system of finance institutions capable of accomplishing financial inter- mediation in for the agricultural and agro-industry."

Mission:

" To put in place a system and institutional arrangements that will ensure increased availability and accessibility of market based rural financial services in Uganda on a sustainable basis".

Rural Finance Issues:

1. Credit is important but it is not necessarily the most constraining factor to increased production and productivity especially for the very poor.

2. Major constraints relate to:

(a) low skills, knowledge levels, negative attitudes and low aspirations.
(b) lack of market information and volatile product and input prices.
(c) *Lack of access to improved technologies.*
(d) Lack of access to and availability of credit.

3- Delivery of rural financial services should be left to the private sector including Micro-Finance Institutions (MFIs) which have a comparative advantage for operation at the grass-root compared to commercial banks. MFIs currently include NGOs (Local and Foreign), co-operative societies (particularly savings and credit societies), farmer groups and credit institutions ("village banks").

1- The government role should be to:

(a) Put in place a legal and regulatory framework.
(b) Capacity building including training of service providers and beneficiaries.
(c) Provision of targeted support on a one-time basis for a specific purpose and target group.

International experience:

1- Subsidised and targeted credit does not achieve the desired objectives and is not sustainable.
2- Peer group pressure can be used to ensure a high repayment rate.
3- Poor people can benefit from services provided by rural finance institutions.
4- Rural financial services should include savings products, credit facilities, lease schemes, hire purchase, money transfer facilities, financial planning and insurance services.
5- To most borrowers, access to loans is more important than the cost of borrowing (interest rates).

Policy Recommendations

1. A legal and regulatory framework for MFIs to should be put inplace for provision of rural financial services countrywide.

2. Government should allocate funds to support MFIs build their management capacity and establish a nation-wide network of associations and groups engaged in deposit taking and credit provision.

3. Government should consider restructuring the Poverty Alleviation Project (PAP) into a Rural Financial Services Agency (RFSA) to provide funds for micro-finance institutions, capacity building and research support. Other Government schemes, for example, Entandikwa, Cotton Sub-sector Development Credit and several funds currently managed by Bank of Uganda (Development Finance Department) should be managed under the Agency.

4. Government should study the option of transforming some rural UCB branches into rural financial intermediaries.

5. Policy formulation and co-ordination for the MFIs should be provided for under the institutional arrangements for co-ordinating the implementation of PMA.

4.4 AGRO- PROCESSING AND MARKETING

Vision:

" Increased and sustainable supply of competitive, processed and non-processed agro-products on domestic, regional and international markets."

Strategic Issues:

1. Weak infrastructure of feeder roads, means of transportation, markets and market information, storage, cooling and agro-processing sector.

2. Low agro-processing base due to weaknesses in the utilities (water, electricity, and telecommunication), banking, regulatory and raw material supply sector.

3. Low domestic aggregate demand for processed products.

4. Shallow penetration of regional and international trade markets due to low export management skills, weak institutional (export promotion, financing, commercial laws and grades and standards) arrangements, and non- competitive products.

5. Agro-processing technology institutions are weak, poorly funded and under developed. Appropriate legal and other incentives including research should be identified to promote this area.

6. Capacity for the country to effectively participate in the WTO / GATT agreement negotiations is weak and particularly in the Ministry of Agriculture Animal Industry and Fisheries.

Policy Recommendations:

1. Government should send a clear message that it has divested itself from production, processing and marketing activities to pave way for the private sector involvement in such areas except where there is a "public good" justification.

2. The role of the Central Government will be to create an enabling environment for the private sector by setting appropriate policies, regulations and standards, dismantling barriers and providing support services.

3. Government should support initial capacity building for market infrastructures including establishment of an agricultural commodity exchange, a warehouse receipt system and fish landing sites.

4. Capacity should be built for Local Governments to be effectively responsible for providing private sector support services such as feeder roads and rural markets.

5. Research in the agro-processing should be strengthened in partnership with the private sector and appropriate incentives provided to promote agro-processing.

6. Parastatal bodies, such as UEPB, UIA and UNBS should have their legal mandates reviewed and their functions harmonised to ensure efficiency and effectiveness.

7. Government should build capacity to interpret provisions under the WTO/GATT and disseminate their implications to all stakeholders. MAAIF should have a role to play in this area in collaboration with MTTI.

8. Deliberate public sector interventions should be made to ensure that Uganda's peasant agriculture can deliver products on the global market competitively.

4.5 PRIVATE SECTOR INVOLVEMENT.

Vision:

"A private sector led agriculture that is profitable, efficient, competitive, dynamic and sustainable".

Mission:

"To develop a legal, regulatory and institutional framework that will promote and deepen private sector involvement in commercial agriculture".

Private Sector Issues:

1. Access, availability and affordability of agricultural technologies.
2. Access, availability and affordability of agricultural finance.
3. Access, availability and affordability of market information and input and output markets.
4. Access, availability and affordability of on-farm and off- farm storage, warehousing, packaging and handling facilities.
5. Physical infrastructure including feeder roads, power supply, water and telecommunication.
6. A dynamic supply of a strong human resource base of entrepreneurs, business managers, lawyers, engineers, bankers and research scientists.
7. Effective and efficient support institutions and organisations.
8. Functional commercial laws, courts and registries; a system of well publicised and enforceable product grades and standards.
9. Access and availability of land supported by a comprehensive land policy and functioning land registry

Policy Recommendations:

1. Undertake an institutional assessment and functional analysis of agricultural institutions including farmers' organisations and government parastatals and provide the necessary support to ensure effectiveness and efficiency in service delivery.

2. Provide support to the development of the human resource capacity through formal and informal institutions for skills and knowledge development, and effecting attitude change among the subsistence farmers.

3. Undertake strategic interventions to enhance private sector involvement in delivery and funding of research and extension.

4. Support development of strategic infrastructure including commodity exchange , warehouse receipt system and fish landing sites.

5. Review, update and put in place appropriate commercial laws, courts and registries; and product grades and standards in support of the private sector activities; and ensure their enforcement.

4.6 LAND REFORM AND MANAGEMENT.

Vision:

"Security of land tenure for efficient, effective and sustainable utilisation of land for eradication of poverty."

Mission:

"To put in place a system and institutional arrangements that will ensure security of land tenure and efficient and sustainable land use in Uganda".

Emerging Issues:

1. Issues arising from the Land Act:
   The current Land Act is unaffordable and un-implementable.

2. Issues arising from policy:
   There is no policy on land.

3. Other Issues:
   Land reform is a long- term process that requires sustainable political commitment and support services / actions.

International Experience.

1. Land titling on its own does not lead to agricultural growth. Investments in education, market-oriented policies, domestic savings, and other areas also contribute to optimal use of land.

2. Land reform is a long-term and costly investment and needs sustained political commitment.

3. Agricultural Modernisation that addresses poverty and food security can be achieved through smallholder farming as well as through large scale mechanised commercial farming.

Policy Recommendations:

1. There is need to formulate a land policy that covers land use and management, investment in land and harmonises land policy with the PMA and other policies including the decentralisation law.

2. The existing Land Act needs to be amended so that it is affordable, implementable and provide for the contradictions with existing regulations. The recommendations of the Land Act review team should be implemented.

3. The location, size, use of the existing Government land should be established with the view of optimising it's use under the decentralisation and privatisation policy.

4. Government should undertake the necessary supporting actions for improving the productivity of land at farm level. These will include; improving the finance and banking sector, building an active land registry, enhancing extension services for increased land productivity and sustainability and provision of legal advice, defence litigation and land survey services.

4.7 WATER FOR AGRICULTURAL PRODUCTION:

I. VISION:

"Availability of water all the year round for increased and sustainable commercial agricultural production without degrading the environment."

II. MISSION:

" To build the capacity to develop water resources and provide water all year round for sustainable commercial agricultural production and, where appropriate, effect agricultural drainage for optimum crop development."

III. Key Issues:

1. The need for appropriate policy and legal framework on water for agricultural production.
2. Access and availability of appropriate and cost effective technologies.
3. Incentives for investment in water supply system for production.
4. Building the National capacity to plan, design, construct / install and manage irrigation, livestock watering and aqua-culture schemes.
5. Addressing increasing problems on soil degradation.
6. Establishment of a database for resource mobilisation planning, designing, construction / installation, monitoring and operationalisation of schemes pertaining to water for agricultural production.
7. The need for proper institutional arrangements and linkages to co-ordinate water for agricultural production.
8. The need for participatory and holistic approaches on watershed management and environmental issues.

IV. International Experience:

1. Supplementary irrigation, as a drought alleviation strategy is not an economic proposition when handled on adhoc basis (i.e waiting for drought to strike then mobilise for irrigation or valley dam construction).

2. Smallholder irrigation is viable when low-cost and effective technologies are used to facilitate increased and more reliable production of high-value products on a continuous basis.

3. New forms of rainfall insurance arrangements are being studied to be provided by the private sector.

V. Policy Recommendations:

1. Central Government should provide for research on irrigation and on-farm small-scale irrigation demonstrations, small to medium scale dams, valley tanks construction and fishponds.

2. The private sector should be supported and promoted to take over planning, designing, construction / installation of infrastructure pertaining to water for agricultural production.

3. All irrigation schemes, livestock watering structures, fishponds whether small or large requiring rehabilitation should be re-appraised and included in the national investment plans and assigned priorities and beneficiaries restructured to take over management.

4. Government should renovate and equip both agro-meteorological field stations and soil physics laboratories in the country to facilitate planning and designing of water for production structures.

5. Government should support the establishment of fish hatcheries to accelerate rapid multiplication of fish species, identification of appropriate fish seeds and formulation of fish feeds.

6. A curriculum should be developed to address water resources exploitation and management for water for agricultural production. The training needs assessment to be in the overall policy framework.

7. Central Government should study the option of establishing strategic irrigation, livestock watering and acquaculture infrastructure which would later be privately run.

4.8 FORESTRY

VISION

" A profitable and sustainable agro-forestry sub-sector integrated within the agricultural and non-agricultural economy

MISSION

" To enable farmers grow trees and manage forests in the farming system to sustainably produce vital products and services for food security and poverty eradication".

Forestry Issues:

1. Lack of an overall agricultural policy in which farm forestry would occupy it's rightful niche;
2. Some constitutional provisions that have created legal inconsistencies.
3. Fragmentation and scattering of the forestry mandate in several government agencies has caused duplication of efforts and wastage of resources.
4. There is an administrative and technical bias towards protected forests/trees.
5. Looking at forestry research as a commodity has led to reduced investments in the sector.
6. The contribution of tree resources to the national economy, especially in the energy sector has not been adequately appreciated.

Policy Recommendations

1. A comprehensive agricultural policy and legal framework, in which farm forestry will feature prominently be formulated;

2. Agro-forestry should be integrated into the agricultural extension services like other crop commodities. The Ministry of Agriculture, Animal Industry and Fisheries be given this mandate to be co-ordinate and implemented in the district extension programmes.

3. The forestry mandate, including the respective research, should be consolidated and put in one ministry together with wildlife.

4. Legal and technical mechanisms be devised to manage privately owned natural forests and those on government land

5. Farm forestry be included in the curriculum of all forestry, agricultural and animal husbandry courses and

6. A Forestry Authority should be established to stimulate private sector involvement in farm forestry and streamline the management of public forests.

4.9 ENVIRONMENTAL ISSUES:

I. VISION:

"Environmentally sustainable agriculture contributing to sustained poverty reduction and the transformation of rural Uganda".

II. MISSION:

"To ensure that the plan for the modernisation of agriculture does not, at the minimum, contribute further to environmental degradation; and in fact helps to reduce even the existing degradation features."

III. Environmental Issues:

1. Overall, there will continue to be contradictions between the objectives of increased agricultural production and environmental sustainability, at least in the short – and medium – terms.
2. Soil erosion and declining soil fertility will continue to be of greatest concern in the short and medium term period.
3. Land will continue to be used sub-optimally up to the medium term at least.
4. In the short and medium term, the laissez faire attitude of the private sector towards environmental protection and conservation will prevail although perhaps at declining levels.
5. The plan for modernisation of agriculture may present attractive opportunities for transitional corporations to participate but Uganda does not have the capacity to successfully negotiate with, and monitor the research and development activities of these behemoths.
6. Although Uganda is recognised as having a comprehensive set of environmental policies, laws and regulations not many know of their existence, leave alone understanding their provisions.
7. The need to strengthen the early warning system is paramount considering that Uganda experiences frequent droughts and sometimes floods and does not have adequate disaster preparedness.
8. The intensification of agriculture as envisaged in the PMA will invariably lead to higher levels of pollution, mono-cultural crop systems, increased use of biocides, release of genetically engineered materials, and declines in biodiversity.

9. In the absence of moral persuasion and self-compliance, there is need to develop appropriate incentives and disincentives measures to encourage environmental protection and conservation within the framework of the PMA.
10. Although sectoral institutional instruments dealing with the environment are many, some of these policies, laws and regulations are deficient or outdated and need to be revised if they are to support the plan for modernisation of agriculture towards sustainability.
11. Community management structures for environmental protection and conservation are universally weak throughout the country despite the fact that these grassroots institutions are ideally located to contribute significantly to environmental protection and conservation.

IV. Policy Recommendations:

1. Carry out formal structured environmental impact assessment (EIA) of the PMA after specific investment targets have been specified.
2. Create an enabling policy, legal and regulatory environment to strengthen institutional capacity so that environmental issues concerning PMA are addressed.
3. Monitor the progress of incorporating environmental concerns during the agricultural modernisation process.
4. Mandate and equip the National Environment Management Authority (NEMA) to oversee the incorporation of the environmental issues in the Plan for modernisation of agriculture.
5. Strengthen local authorities to be able to implement environmentally friendly programme.
6. Integrate environmental science in school curriculum at all levels.

and local authorities environment offices.

4.10 RESOURCE ENVELOP FOR THE SECTOR:

VISION:

" An efficient, effective and sustainable agricultural sector support financial system."

"MISSION:

" To create financial institutions and management systems that maximise the mobilisation, allocation and utilisation of financial resources for the agricultural sector on a sustainable basis"

Financial Issues:

1. Public spending in the agricultural sector over the last three years increased by 17% from Ushs 48 billion (bn) in 1996/97 to 56 bn in 1998 with donors contributing 75% of the total budget and over 85% of the development budget.
2. MAAIF (extension) and NARO (research) account for 75% of total sector expenditure with 10% provided through other government ministries and agencies and 15% through NGOs.
3. Public spending in the sector is projected to increase to 103.7 bn in 1999/00, fall to 80 bn in 2000/01 and to 66 bn in 2001/02. The Medium Term Expenditure Framework allows for 60.3 bn, 68.7 bn and 77.6 bn for 1999/00, 2000/01, and 2001/02, respectively.
4. The allocation of planned spending over the next three years shows that research and extension account for 53% of expenditure; management and institutions 14%, pest and disease 9%, district and community support 6%, and other projects 16%.
5. Opportunities for greater cost-recovery and contracting out of service delivery to increase private sector funding to agriculture and increase the efficiency of public sector resource use need to be explored.

6. 48% of planned development expenditure in agriculture over the medium term appear to be consistent with the principles and priorities of PMA, 36% (mainly going to research and extension) require review and 16% (Olweny Rice Scheme, Vegetable Oil Development Project and construction of landing sites) require review and re-alignment.

Policy Recommendations:

1. Donors will continue to play a major role in the financing of PMA based programmes and therefore, sector institutions should ensure that donor funds are utilised in an efficient and sustainable manner.
2. In order to ensure that donor financed programmes are in harmony with PMA principles and objectives, there will need for strong donor co-ordination at policy level.
3. The role of NGOs in the agricultural sector is significant (handle about 15% of the sector funds). Therefore, NGO programmes should be captured in public sector planning for the agriculture sector.
4. The implications to macro-economic stability and government's capacity to meet recurrent costs implied by the projected increase in spending above the resource envelope should be studied and addressed at the earliest.
5. Capacity building for institutions that can deliver services in an effective, efficiency and sustainable manner is urgent and will demand for increased resource allocation for capacity building and institutional strengthening especially at district level (local governments, CBOs and NGOs).
6. A widely acceptable criteria for assessing the consistency of sector programmes with PMA principles and objectives should be agreed up for the re-alignment of existing programmes and design of new PMA based programmes.

4.11 AGRICULTURAL SECTOR INSTITUTIONAL STRENGTHENING

VISION:

" Sustainable agricultural sector development institutions working in partnership and co-ordinated within a decentralised and liberalised framework"

MISSION:

" To increase the efficiency, effectiveness and sustainability of agricultural sector development institutions while enhancing their partnership and co-ordination within a decentralised and liberalised framework in which public participation continuously gives way to more private sector involvement."

Strategic Components:

1. Strengthening strategic and operational planning capacity at all levels.
2. Improving operational capacity of MAAIF, districts and sub-counties.
3. Improving management systems for activities and for human, financial and physical resources.
4. Developing a national network of agricultural training, knowledge, information and communication systems.
4. Developing of linkage, co-ordination and partnership system.
5. Promotion of institutional development processes in private agricultural sector institutions.
6. Promotion of sustainable agricultural development financing mechanisms and institutions.
7. Institutionalising performance assessment.

Recommended Actions:

1. Review and harmonise the mandates and legal frameworks of agricultural sector institutions to remove operational overlaps.
2. Undertake functional analysis of the institutions - especially MAAIF and the District departments of production - which would lead to clear articulation of

Matrix 1:

Central and Local Government's roles in the PMA as derived from the Local Governments Act, 1997

CENTRAL GOVERNMENT	DISTRICT LOCAL GOVERNMENT	LOWER LOCAL GOVERNMENTS
1. Formulation of agricultural policies 2. Research and technology generation. 3. Formulation of agricultural standards. 4. Mobilisation of funds for agricultural activities. 5. Capacity building to Local Governments in planning and implementation of programmes. 6. Assist Local Governments to identify and deploy technically qualified personnel. 7. Inspect and monitor agricultural programmes and projects.	1. Delivery of extension services. 2. Entomological services and vermin control. 3. Planning, priority setting and designing extension delivery mechanisms. 4. Land administration. 5. Land surveying. 6. Physical planning. 7. Forests and wetlands management. 8. Licensing of produce buying.	1. The provision of agriculture ancillary field services. 2. The provision and control of soil erosion and protection of local wetlands. 3. The control of vermin in consultation with relevant ministries/agencies. 4. Taking of measures for prohibition, restriction, prevention, regulation or abatement of grass forest or bush fires. 5. The control of local hunting and fishing.

Matrix 2

Public and Private Sector Roles under the PMA.

Goods / Services	Public / private	Source of Funding
Research		
• Development of technological packages	• Public	• General taxation
• Livestock and fisheries research	• Public/Private	• General taxation/Private capital
• Specialised crop research on e.g. Coffee, tea, tobacco, sugarcane	• Private/Public	• Earmarked tax on sales
• Research on other crops like Maize, Banana, Millet, Beans, etc.	• Public	• General taxation
• Research on forestry and environmental issues	• Public	• General taxation/pollution tax
• Production of foundation seed	• Public	• General taxation
Extension		
• Direct advice to commercial farmers	• Private	• Direct payment by farmers
• Direct advice to small-scale holders	• Public/private	• General taxation/cost sharing approach
• Delivery of technological packages	• Private	• Private capital
• Demonstration farms	• Public/Private	• General taxation/ cost sharing
• On-farm trials/demonstrations and mini-kit programmes.	• Public/Private	• General taxation/Private capital
• Capacity building for planting and stocking materials		
Production and storage		
• Input supply (seeds, fertilisers, pesticides, implements, drugs & vaccines)	• Private	• Direct payment by Farmers
• Initial capacity building for input suppliers	• Public/Private	• General taxation/Private capital
• Physical production	• Purely private	• Private capita
• Epidemic disease and pest control	• Public	• General taxation
• On-farm disease and pest control	• Private	• Private capital
• Rural production credit	• Private	• Private capital
• Capacity building for rural credit institutions	• Public	• General taxation
• Land use and natural resource use regulations	• Public	• Land tax and /or pollution tax
• Irrigation infrastructure	• Public/Private	• General taxation/User fees
• On-farm small scale irrigation infrastructure	• private	• Direct payment by farmers
• On-farm small scale-irrigation and water harvesting technologies/ demonstrations	• Public	• General taxation
• Water for livestock production	• Private	• Direct payment by farmers
• Construction of fish landing sites	• Public	• General taxation/User fees
• Management of fish landing sites	• Public/Private	• General taxation/User fees
• Storage facilities		• Private capital

Goods / Service	Public/private	Source of Funding
Processing		
• Supporting infrastructure for water, power, roads and communication	• Public	• General taxation /user fees
• Credit facilities to investors	• Private	• Private capital [
• Capacity building for credit institutions	• Public	• General taxation
• Supply of processing technology	• Purely Private	• Private capital
• Regulation of processing standards and quality	• Public	• Earmarked tax on product sales
• Investment promotion into agro-processing	• Public/ private	• General taxation / member-ship and user fees. association.
• Research and demonstration of agro-processing technologies	• Public	• General taxation
Marketing		
• Establishment of rural markets	• Public/Private	• General taxation/User fees
• Feeder roads	• Public	• General taxation/user fees
• Business advisory centres	• Public/ Private	• General taxation/user fees
• Export promotion	• Public/Private	• Earmarked tax on exports
• Market information supply	• Public/Private	• Users fees
• Credit facilities	• Private	• Private capital
General		
• Agricultural education	• Public/Private	• General taxation/Cost sharing
• Setting of standards and regulations	• Public	• General taxation
• Monitoring, supervision and inspection	• Public/Private	• General taxation/cost sharing
• Capacity building for public and private institutions	• Public/Private	• General taxation/ private capital.

IN ANY CORRESPONDENCE ON
THIS SUBJECT PLEASE QUOTE NO.PMA/C2/12

THE REPUBLIC OF UGANDA

PLAN FOR MODERNISATION OF AGRICULTURE (PMA) SECRETARIAT

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17th August 2001

To: Mr. G. Otim, MAAIF
Mr. Emurut, MOLG
Mr. W. Ainebyona, MFPED
Mr. J. Kyamanywa, NAADS
Dr. G. Gumusiriza, NARO
Mr. C. Acar, MOES
Mr. B. Lubega, MGLSD
Mr. J. J. Oloya, World Bank
Mr. P. Mafabi, MLWE
Mr. J. Olweny, Danida
Mr. Yves Gillet, European Union
Dr. Peter Ngategize, MFPED
Mr. C. Owach FAO

From: **Dr. W. Odwongo**, Director, PMA Secretariat

Subject: **PROPOSED CRITERIA FOR REVIEW AND RE-ALIGNMENT OF PROJECTS / PROGRAMMES WITH THE PLAN FOR MODERINISATION OF AGRICULTURE**

Please find below the draft criteria that was revised during the last meeting of the PMA Sub-Committee on Projects/Programmes for your information and review. You may use it to test the sample projects that you already have and advise the Secretariat accordingly, before it is presented to the PMA Streering Committee for approval/ adoption.

Tick (√) the PMA Priority area(s) that the Projects/Programmes addresses

PMA Priority Area	Tick (√)
• Research and Technology Development	
• Provision of Advisory Services	
• Agricultural Education	
• Access to Rural Financial Services	
• Supportive Infrastructure	
• Agro-Processing and Marketing	
• Other (Specify)	

NO	REVIEW CRITERIA	SCORE	
I. Extent to which Project contributes to the aims and objectives of the PMA		**70**	
1.	**Increase In Incomes And Improvement Of Quality Of Life Of The Poor**	**30**	
	a) Is the project targeting the needs and constraints of the vulnerable groups such as subsistence farmers, women, widows, female-headed households, people with disabilities, youth, orphans, elderly and the sick (HIV/AIDS) ?	8	
	b) Will the Project build capacity of the poor/community to benefit directly from and take up new opportunities offered by the Project to improve their well being ?	5	
	c) Is the project Gender sensitive and responsive to the constraints and needs of the community (offering equal opportunities for both men and women) ?	5	
	d) Are project resources/funds allocated to poverty eradication activities/ interventions ?	4	
	e) Does the Project address a strategic intervention, opportunity or challenge, such as reduction of losses and value addition ?	4	
	f) Does the Project empower the target group to continue activities after the Project ends ?	4	
2.	**Household Food And Nutrition Security In The Broad Sense**	10	
	a) Will the Project build household capacity for increased productivity ?	5	
	b) Does the Project encourage production for the market ?	5	
3.	**Provision Of Gainful Employment**	**15**	
	a) Does the Project promote job creation ?	5	
	b) Does the Project promote income generation ?	5	
	c) Are there opportunities for secondary benefits such as agro-processing and improvement of market infrastructure ?	5	
4.	**Sustainable Use And Management Of Natural Resources?**	**15**	
	a) Project will conserve natural resources such as soil, water and forests.	5	
	b) Project will not negatively affect the environment.	5	

	c) Project will promote sustainable use and management of natural resources.	5	
II.	**Implementation Within The PMA Policy Framework And Principles**	**30**	
1.	**Provision For Multi-Stakeholder Participation In Initiation, Design, Implementation, Monitoring and Evaluation.**	**15**	
	a) Participation of the target group(s).	4	
	b) Participation of the Local Governments, Lower councils and Communities.	3	
	c) Participation of the Civil Society.	3	
	d) Participation of the Private Sector.	3	
	e) Adequate linkages with other stakeholders and service providers such as training institutions and farmer organisations.	2	
2	**Can The Project/Programme Be Incorporated Into PMA Financing Arrangements?**	**15**	
	a) Project focuses on public goods and/or services such as multiplication of foundation seed, demonstration plot showing improved technology and repair of a bridge on a community road.	8	
	b) Resources are allocated to interventions/activities that ensure timely and quality delivery of outputs	2	
	c) Mechanisms for proper use and accountability of project resources are clear and adequate.	3	
	d) Mechanisms for monitoring, evaluation and reporting are clearly outlined.	2	
GRAND TOTAL		**100**	

Decision

√ **1. Project scoring 60% and above :- PMA complaint / compatible.**
Action: Approve the project.

* **2. Project scoring below 60% :- Not PMA compliant / compatible.**
Action: Refer the project back to origin for improvement of compliance and re-submission for review and re-alignment.

LE SECTEUR AGRICOLE EN OUGANDA

Le PMA, " Plan For Modernisation of Agriculture " est l'application du PEAP, " Poverty Eradication Action Plan ", au secteur agricole, qui représente en Ouganda 80% des emplois et 43% du PIB.

LE PMA, PLAN FOR MODERNISATION OF AGRICULTURE

Le PMA est le programme stratégique du développement rural de l'Ouganda. Sa mission est de transformer une agriculture de subsistance en agriculture commerciale, à travers l'amélioration des services, de la technologie et des flux d'informations. Trois types de fermiers ont été distingués : fermiers commerciaux (5%), fermiers semi-commerciaux / petits cultivateurs (25%) et fermiers de subsistance (70%). Le PMA envisage de faire passer la moitié des fermiers de subsistance en fermiers commerciaux d'ici 25 ans, grâce à une hausse de la production (pour la consommation domestique et pour le marché) liée à une hausse de la productivité.

1/ Un programme transversal

Le PMA ne concerne pas seulement le secteur agricole mais est lié à plusieurs ministères et plusieurs secteurs d'activités. C'est là la spécificité d'un programme favorisant une approche interministérielle, avec 6 ministères concernés, et multibailleurs. Il y a donc une **interconnexion** entre plusieurs branches de l'économie. Le PMA distingue huit domaines :

- la recherche et le développement agricole
- la décentralisation des services
- la finance rurale
- l'agro-alimentaire et le marketing
- le secteur privé
- la réforme de la propriété
- l'eau
- la foresterie
- l'environnement

2/ Un programme qui accompagne le processus de décentralisation

Une forte **coordination entre les différents acteurs** est mentionnée en tant que condition nécessaire afin d'assurer une la bonne application des programmes financés par les donneurs au PMA. Pour ce faire, le PMA est articulé autour d'organismes tels que le NAADS, National Advisory Agriculture Delivery Services, composante spécifique du PMA dans le domaine de la vulgarisation agricole, l'ACU, Agricultural Council of Uganda, ou la NARO, National Agricultural Research Organisation.

Le PMA donne une grande priorité à la **décentralisation**, à travers les gouvernements locaux, qui se voient dotés de plus grands pouvoir . Des centres locaux seront chargé de l'application

du PMA, tels les ADC (Agricultural Development Centers) ou ARDC (Agricultural Research and Development Centers).

Le **secteur privé** est impliqué dans la plupart des secteurs, notamment la finance rurale (Micro-Finances Institutions) et les organisations de fermiers (coopératives, et un meilleur environnement sera mis en place pour faciliter son développement (juridique, standards et normes, infrastructures, propriété privée, ...).

3/ Projets français s'intégrant dans le PMA

Le projet " professionnalisation de la filière laitière dans le district de Mbarara " s'intègre dans le PMA :

- il illustre les priorités sectorielles
- il prévoit une coordination entre bailleurs et s'articule sur la décentralisation
- il s'appuie sur des organismes " relais " nationaux (NARO, NAADS) et les organisations de fermiers.

PROJETS DES AUTRES BAILLEURS DANS LE SECTEUR AGRICOLE

Aide budgétaire générale : DFID, Banque Mondiale, ADB, Union Européenne, Pays-Bas, Suède

Aide aux districts : Danemark, Irlande

Aide – Projets : principaux bailleurs et exemples de projets :

* *DFID* : associations de micro-finance, loi sur la propriété foncière, Entreprises vétérinaires rurales, pêche, transformation alimentaire, Eco tourisme, foresterie, lacs
* *Danemark* : programme sectoriel agricole incluant la réhabilitation de l'industrie laitière, élevage, assistance à l'UNFA[1], ...
* *Union Européenne* : thé, soie, foresterie, exportations, agro-alimentaire, élevage, recherche et développement
* *USAID* : transformation agricole, lait, marketing, exportations agricoles, conservation des ressources naturelles, Eco tourisme, micro-finance, secteur privé (programmes Speed et Compete)
* *Banque mondiale* : Recherche et développement, secteur coton, soutien au NAADS/NARO,...
* *Italie* : formation , utilisation des ressources naturelles, marketing, santé animale.
* *Pays-Bas* : drainage

[1] Uganda National Farmers Association

ANNEXE 2

Annexe 2 – A : Traduction en anglais (Cédric LE BAS)

Annexe 2 – B : Documents rédigés par le MUST

Annexe 2 – C : Documents « Countrytaste »

Annexe 2 – A

Traduction en anglais (Cédric LE BAS)

LABORATORY for MILK QUALITY CONTROL
at the M'BARARA UNIVERSITY of SCIENCE and TECHNOLOGY
(MUST)

1. Tests performed on milk at the laboratory for the moment

physico-chimical, platform tests :

- Temperature
- Organoleptic test (colour, smell)
- Cloton Boiling
- Alcohol test
- Lactometer reading
- Resazurin test

Microbiology :

- Total plate count
- Total coliforms at 35°C

2. Steps proposed for the progressive extension of the analysis

Those steps are a proposal for a progressive extension of the analysis, in relationship with the priorities expressed by the stakeholders of the milk subsector. They are taking into account the different aspects of the milk quality (sanitary, nutritional, economical or organoleptic quality, for instance).

Step 1 : The following analysis are able to be performed immediately, if the laboratory acquires few more material

Bacteriology :

- Fecal coliforms
- E. coli

Serology :

- Ring test : search for antibodies against Brucella in the milk

Step 2 : Analysis that represent a priority for the dairy development authority (DDA) and that require more place and material.

Public health : diagnostic of tuberculosis : Isolation of Mycobacterium (bacteriological culture on specific medium) and identification, differentiation between M. tuberculosis and M. bovis (PCR, ELISA ?)

Bacteriology :

- Staphylococcus aureus
- Salmonella
- Yeast and moulds

Searching for residus (antibiotics)
Phosphatase and peroxydase tests for the pasteurised or sterilized milk

Step 3 : Analysis to be considered in the future depending on specific requests

Bacteriology (Listeria for instance)
Specific of some milk products (Clostridium sp. In the cheese for instance)
Specific requests of importing countries (heavy metals, radioisotopes ...)

Other analysis to be considered (Dornic acidity, numeration of cells, fatt content, protein content, dry matter content...)

A test can be done in a more early step if it is considered as a priority, depending on the demand of the stakeholoders. This follow-up is therefore adaptable.

3. Material to be bought for the step 1

- Durham tubes (6*25mm ; 500 pieces = 481 FF)
- Universal bottles Wheaton type (8 ml ; 17*70 mm ; 2 boxes of 144 fioles = 2* 774 FF by Polylabo)
- Antigens and reagents for the Ring test

4. Reference standards for the analysis

- Standards of the UNBS (based on ISO standards)
- Other standards for the analysis without UNBS standards (OIE standard for the ring test, for instance)
- The available UNBS standards are listed in the appendixes

5. Room

Professor Kayanja was insisting on the fact that there will be a need for more place from one step to another. It depends also on the number of the sample that have to be treated. Two propositions were made :

1. To use a room dedicated to the students as an extension.
2. To use the room of the storage of chemicals

6. Personal

Two technicians have been trained at the Uganda national bureau of standards (UNBS) on milk and milk products analysis. They are employed by the MUST. Their work on milk comes behalf the teaching for the students.
Professor Kayanja was proposing to recruit 2 more technicians for the milk analysis, if the number of tests or samples increases.

7. Laboratory status

Professor Kayanja was suggesting the laboratory should be independent : it should be considered as an independent, self sustained unit with recognized staff and knowledge, hosted by the university (MUST). It should rapidly become self sustained through the services given to the clients. The diversity of the clients should reinforce the independence of the laboratory (figure 1).

8. Role of the laboratory

- Reference laboratory for the M'barara region, in relationship with the national reference laboratory (UNBS).
- Milk quality control along the whole subsector (with a priority on the contol of zoonosis such as brucellosis and tuberculosis) in the region of M'barara.
- Support for the auto-control laboratory of the processors, in order to standardise and eventually extend the proceeded analysis.

9. Clients of the laboratory and their interest

- Processors :

Opening to new markets by meeting requirements of new import countries.
Have a support to the auto-control laboratories
Standardize the analysis methods between the different processors (so that the processors are at the same level for a fairly concurrence).

- DDA :

In the frame of the raw and processed milk control program by the government. There is an interest for the DDA to take samples and give them to the laboratory for analysis, in order to assure a good milk quality. The DDA doesn't have any laboratory at the moment to ensure these analysis in the M'barara region.

- FSP (project) :

Through the Government of Uganda (NADS) and the french Ambassy, the second phase of the project could include the sample analysis of milk and milk products taken at different critical points : milking, collecting, chilling, processing...

Figure 1 : Relationship of the laboratory with their clients and other stakeholders

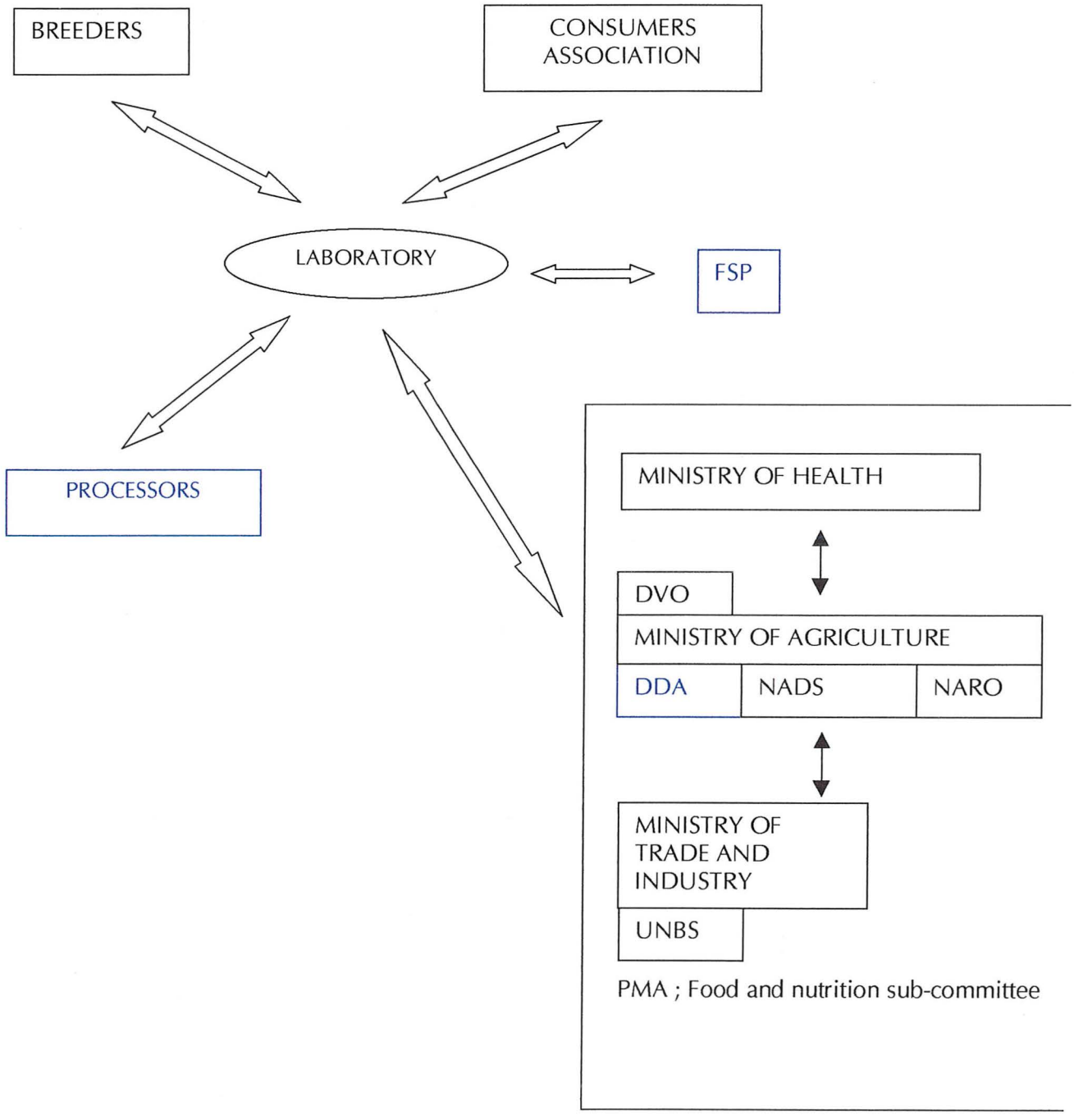


Table 1 : Analysis performed by collecting centers and processors

	OLLECTING CENTERS			PROCESSORS		
ANALYSIS	Kushaka	Kabwohe	Dairy Cooperation	GBK (UHT)	Countrytaste (pasteurised, homogenized)	Paramount (cheese)
Organoleptic	•	•	•	•	•	•
Lactometer	•	•	•	•	•	•
Alcohol		•	•	•	•	•
Resazurin		•	•	•	•	•
Methylen blue					•	
Cloton boiling					•	
Dornic acidity				•		
density					•	
Cryoscopy			•			
Fatt content					•	
Phosphatase				•		
Sampling	Each can	-	-	-	Each tank once/day	Each can

Figure 2 : milk sub-sector in Uganda : simplified scheme

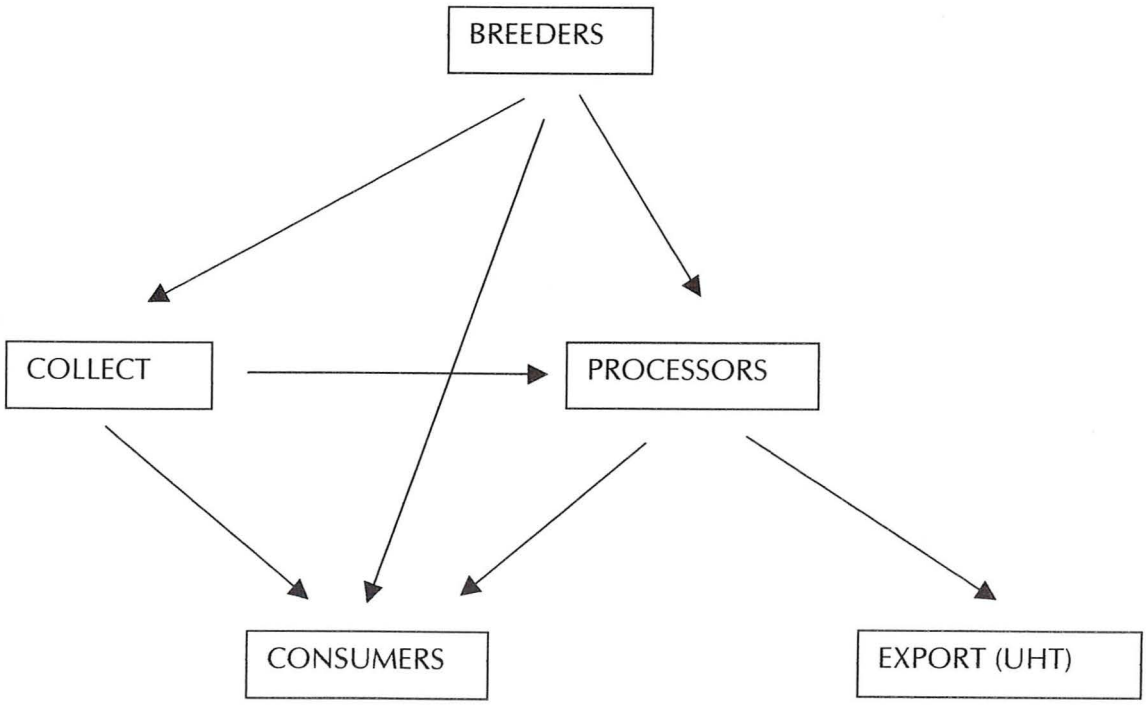
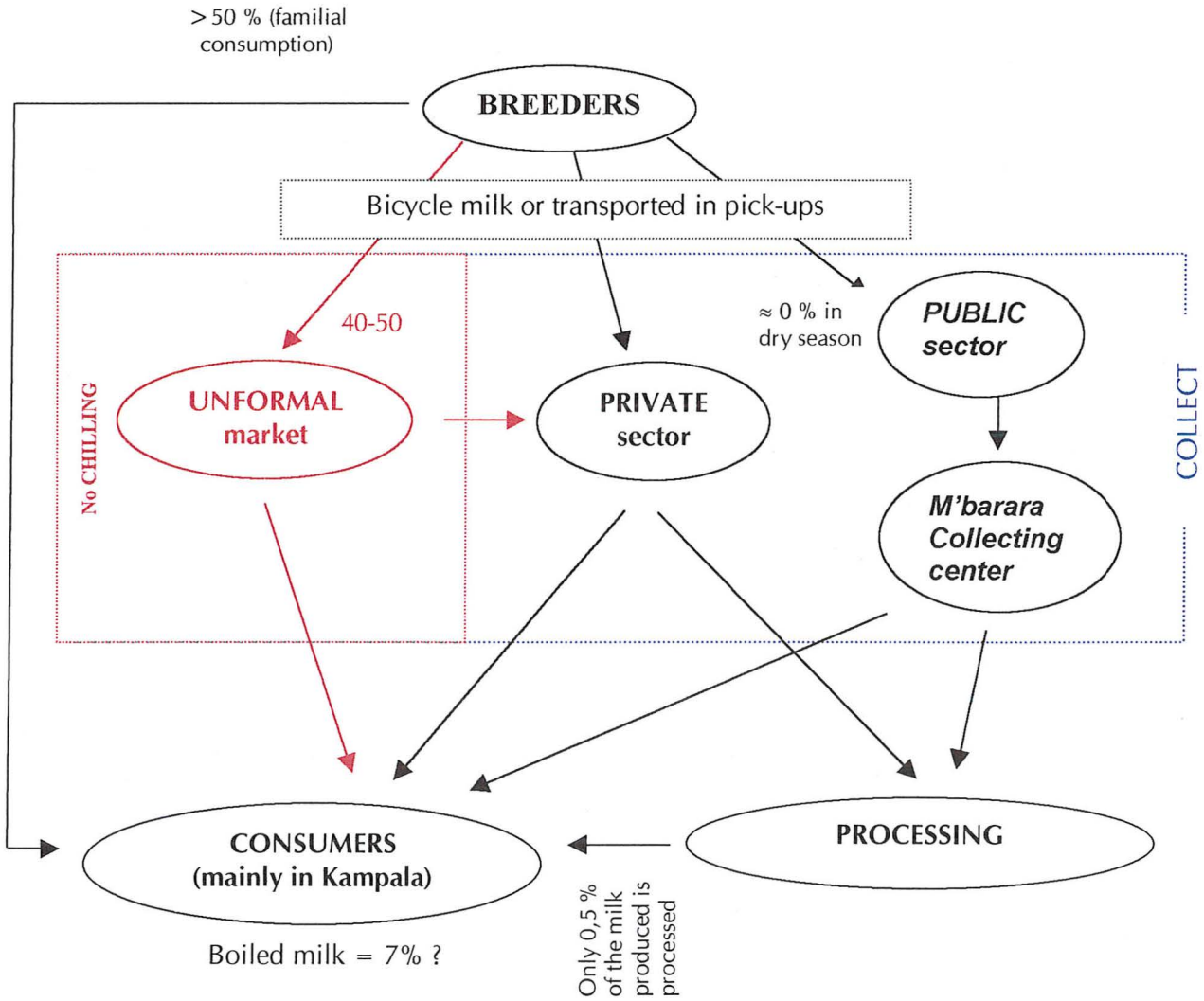


Figure 3 : Formal and unformal markets of the ugandan milk sector (rough percentages)



Annexe 2 – B

Documents rédigés par le MUST

APPROACHES TO QUALITY CONTROL OF MILK AND DAIRY PRODUCTS IN UGANDA.

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SUMMARY

The South Western Region of Uganda is traditionally engaged in livestock farming. The current national status quo of the dairy sector reflects the region's dominance. The formal sector of dairy industry in this area is the most developed compared to other regions. Potential for internal market and export is enormous. However, dairy farming in the region is still affected by many problems ranging from cattle diseases, poor infrastructure and transportation chain of raw milk from farms to processing plants. These negative factors influence milk quality and may jeopardize gains made so far. They have to be addressed if the farmers economic status is to be raised. Government policy on dairy industry has changed over the years. There now exists government regulatory bodies to control quality of dairy and other animal products. The Dairy Development Authority and Uganda National Bureau of Standards have been set up to meet this need. Mbarara University, with support from the French Government, has established a laboratory for milk quality control to assist dairy farmers, processors and other stakeholders in the region to meet the expected milk quality standards.

INTRODUCTION

This presentation is based on observations on dairy industry in South Western Uganda. The region is dominant in dairy Industry and produces many other animal products in Uganda. It is home of the famous Ankole long horned cattle. Cattle play a central role social-economic fabric of the lives of these people. Current estimates indicate that over 60% of milk and dairy products sold in the country come from this region. It is the national milk shed area.

Uganda is land locked but it borders with five countries: Sudan, Kenya, Tanzania, Rwanda and the Democratic republic of Congo. The South Western region comprising of the Districts of Mbarara, Bushenyi, Rukungiri, Ntungamo, Kabale and Kisoro borders with the last three countries. There is potential for direct export of milk/dairy products to these countries and beyond.

Livestock farming is growing and changing from traditional methods of subsistence animal husbandry to market economy in order to meet demand for dairy and livestock products to urban populations. Most of the milk produced is by small scale farmers in rural areas. The bulk of this produce is consumed domestically. A significant fraction is sold in internal markets either directly to consumers or collectively to milk processors. Presently over 95% of the milk produced is consumed in the liquid form. A small but growing fraction is exported in ultra heat treated (UHT) form to neighbouring countries.

In order to meet growing markets, both internal and external, milk production has to improve in quantity and quality. The compounding factors faced by dairy farmers in the region are animal diseases, transportation, processing of milk and storage. These challenges have to be addressed by different stake holders in the dairy industry in order to develop economies of the rural farming communities. Improved farming practices are necessary if dairy animals are to produce quality milk. Fast means of milk transportation for delivery to consumers/processors, storage facilities at milk collection centres and subsequent delivery to processing plants are prerequisites to milk quality control.

Traditional and improved methods of milk production on farms

Indigenous Ankole cattle are low milk producers although they are better adapted to the tropical environment than exotic breeds. Traditionally these animals were used for dual purposes: milk and meat. Milk from these breeds is known to have a higher fat content than exotic ones. The low milk yield factor is being addressed by cross breeding with exotics. Introduction of exotic genetics has led to higher milk production, which raises family income. However, this practice in turn demands change from traditional methods of animal husbandry and milk hygiene in order to meet market demand. Farmers in S.W. Uganda are trying to grapple with the new challenges.

Animal health and production of good quality milk for marketing

Animal diseases have direct influence on milk quality. Dairy farmers are the primary stakeholders in dairy industry. The genetics of cattle and health status are the primary determinants of milk quality produced. Livestock farmers are faced with a number of animal diseases, some of them zoonotic in nature. The most important one is East Cost Fever (theileriosis). This demands stringent control of vector ticks by routine spraying cattle with acaricides. When individual animals succumb to the infection, they are treated with drugs, especially antibiotics. Other common diseases are brucellosis, tuberculosis, foot and mouth disease and anaplasmosis. Exotic and cross bred cattle are more susceptible to these diseases than indigenous ones. Consequently, there is now a more frequent use of acaricides and antibiotics to control diseases on dairy farms. It is imperative that irrational use of acaricides and drugs by farmers directly affect milk quality due to their residues. Collorary to this is control of some diseases by national programmes e.g. vaccination and quarantines. Some of these programmes have to be addressed at tans-territorial level. Personal health and hygiene of herdsmen and milk handlers e.g. milk men also have direct influence on milk quality.

Effects of food supplements and concentrates on milk quality

The type of animal feed and supplements have an influence on milk quality. However, most farmers in Uganda maintain their cattle on natural pastures and legumes. Even peri-urban "zero grazing" units rely on naturally produced fodder and food by products like maize bran or plantain peelings. Industrially produced concentrates which might contain

hazardous chemicals are not used. Hence milk production in Uganda is still by organic farming practice.

Transportation and storage of raw milk

Raw milk deteriorates fast. Rapid cooling and quick transportation to milk cooling/processing pants is essential. In Uganda, most of the milk is transported from farms by vendors using bicycles to either milk collection units or directly to consumers who have to boil it immediately after delivery in their homes. The milk which is delivered at milk processing plants is always pasteurerised before it is marketed. This processed produce is hygienic and has a longer shelf life. However, milk processed through pasteurilisation plants is still a small fraction (about 10%) of the overall milk produced. Poor infrastructure, road net work and lack of adequate cooling facilities in the milk transport chain remain a major constraint in marketing of quality milk.

Evolution of National Policy of Dairy Industry and quality control in Uganda

In 1967, Uganda Government established a Dairy Corporation which was responsible for developing and regulating dairy industry; collection of milk from farmers, processing it and marketing it in urban centres. This arrangement created a monopoly for nearly 30 years. However, current government has changed the broad macro-economic policies to liberalisation of trade and industry. With regard to dairy industry, a dairy master plan was developed and adopted in 1993. This liberalisation of dairy industry enabled private interpreneurs to compete in processing and marketing dairy products.

In 1998, government established Dairy Development Authority (DDA) by Dairy Industry Act No. 11 to oversee the liberalised dairy industry. DDA is governed by a Board of Directors. It derives representation from dairy farmers co-operatives/associations, dairy processing companies, Uganda Veterinary Association and the Ministries of Agriculture and Animal Industry plus that of Finance, Planning and Economic Development. DDA is run by a secretariat. Its roles are to:

- Promote development of dairy industry by private interpreneurs;
- Regulate players and stake holders in dairy industry;
- Provide advisory services to government, milk producers and processors;
- Modernise dairy industry through healthy competition;
- Act as arbitrator in any conflict between stakeholders;
- Control and regulate dairy related import and export activities

The regulatory and quality control services implemented by DDA are derived from standards stipulated by the Uganda National Bureau of Standards. The latter has recently been recognised by the International Acreditation Forum and is allied to the South African National Acreditation body. Dairy and other animal products in Uganda have to be given UNBS seal of approval before they are marketed for export.

ROLE OF MBARARA UNIVERSITY IN MILK QUALITY CONTROL FOR DAIRY INDUSTRY IN S.W.UGANDA

A JOINT MUST/FRENCH EMBASSY PROJECT

OVERALL PROJECT OBJECTIVE

To enhance the contribution of milk production in the eradication of rural poverty through IMPROVEMENT OF MILK QUALITY

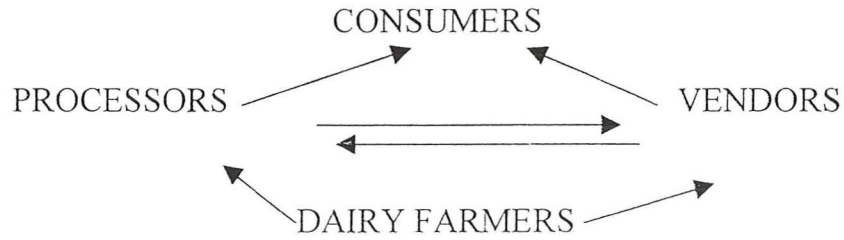
SPECIFIC MUST OBJECTIVE

To render technical/analytical services on milk quality control to all stakeholders in the dairy industry:

- Dairy farmers
- Milk processors
- Vendors/traders
- Consumers

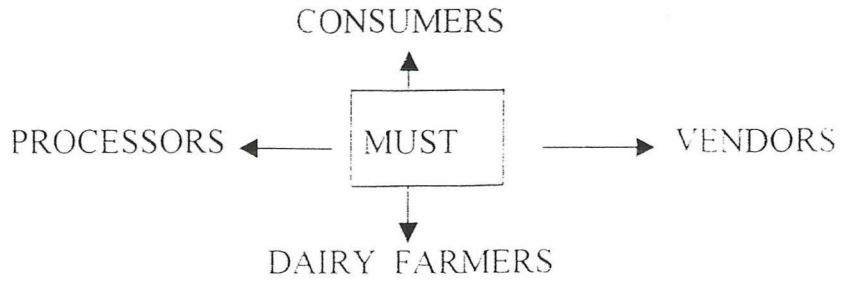
MILK QUALITY CONTROL INTERLINKS

The three main categories in the production, processing and distribution of milk and dairy products have a direct influence on milk quality and its products.



MUST SERVICES TO STAKE HOLDERS

MUST is to use its technical and scientific expertise to offer laboratory analytical services to all stake holders in the dairy industry by monitoring milk quality control of the dairy products in the network.



HOW?

- MUST with assistance from French Embassy and CIRAD is setting up laboratory facilities for milk quality control.
- The Dairy Development Authority (DDA) is to provide guidelines on the services to be offered.

- The National Beraeu of standards (UNBS) is to specify the standards that have to be mate by the stakeholders.
- MUST will make routine monitoring of dairy products at different points in the production/consumption network.

WHY START WITH MBARARA MILK SHED?

Historically the South Western Region of Uganda is traditionally engaged in livestock breeding current national status quo of the dairy sector reflects the regions dominance. Currently the formal sector of dairy industry in S.W. Uganda is the most developed compared to other regions. However poor milk quality jeopadise gains made so far

MUST/FRENCH EMBASSY ACHIEVEMENTS

During the initial stages of project implementation, the following achievement have been recorded.

- Memorundum of understanding between MUST and the French Embassy in Uganda has been signed.

- Two technical personnel have been trained by UNBS on milk quality analytical techniques. The training was funded by the French Embassy.

- CIRAD has donated laboratory equipment and supplies to MUST.

- The French Embassy has donated funds for purchase of laboratory equipment.

- MUST has earmarked scientists to run the milk quality control project.

- MUST has provisionally allocated laboratory space for initiating the project.

THE WAY FORWARD

The following issues are to be addressed soon:

- Complete stocking/equipping the project laboratory
- Forming a technical committee for all stakeholders
- Monitoring quality of raw milk and dairy products from all stakeholders.
- Research activities in milk quality control
- Advisory/feedback and networking among stakeholders
- (A detailed list of recommendations is appended)

ACKNOWLEDGEMENT

MUST is immesely appreciative of the initiative taken by the French Embassy and CIRAD to promote this project

Prof. W. K.Isharaza
Coordinator

MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY

PROCEEDINGS OF THE WORKSHOP OF MUST/FRENCH MILK PROJECT HELD 09 AUGUST 2000 AT MBARARA UNIVERSITY INN

Recommendations:

Following is a summary of recommendations which were made with regard to establishing a milk quality control laboratory at MUST:

1. A comprehensive plan for the proposed laboratory be made and a work plan with budget be drawn for gradual build up to international standards.

2. MUST team should visit and consult with UNBS in realisation of (1) above.

3. A programme should be drawn for training of trainers in milk quality control procedures.

4. The laboratory should establish direct links with all stake holders in the dairy industry and help coordinate information flow.

5. The long term strategy should be to make self-sustaining service laboratory to all stake holders especially dairy farmers and processors.

6. A technical committee should be formalised and its functions defined.

7. Dairy Development Authority (DDA) of Uganda which has been formed should play key role in providing guidelines for regulatory and milk quality control procedures.

8. WUDA should play key role in sensitising its member farmers, who are the primary producers, on factors affecting milk quality control. This would be through holding seminars and providing guidelines on pamphlets.

9. MUST should undertake studies to identify the hazard and quality control points in the milk delivery chain i.e. at farm level, during transportation, processing and post processing and marketing.

10. MUST should undertake research to identify key factors that affect milk quality properties e.g. processability maximum residue limits of acarricides and veterinary drugs, feed supplements, e.t.c.

11. MUST jointly with CIRAD should establish activities focussed on addressing the hazard and quality critical control points in the "milk chain"

DAIRY INDUSTRY AT A GLANCE (1999)

1. Number of cattle: 5.6m
2. Annual Milk production: 640m litres
3. (a) Per capita consumption: 30 litres
   (b) WHO recommended per capita consumption: 200 litres

MILK MARKETING AND CONSUMPTION HABITS

1. 50-70% of milk produced is consumed by farm families.
2. Of marketed milk, about 10% is marketed processed and packaged. 90% of sold milk sold in loose form.
3. Main Milk Markets: Urban Centres.

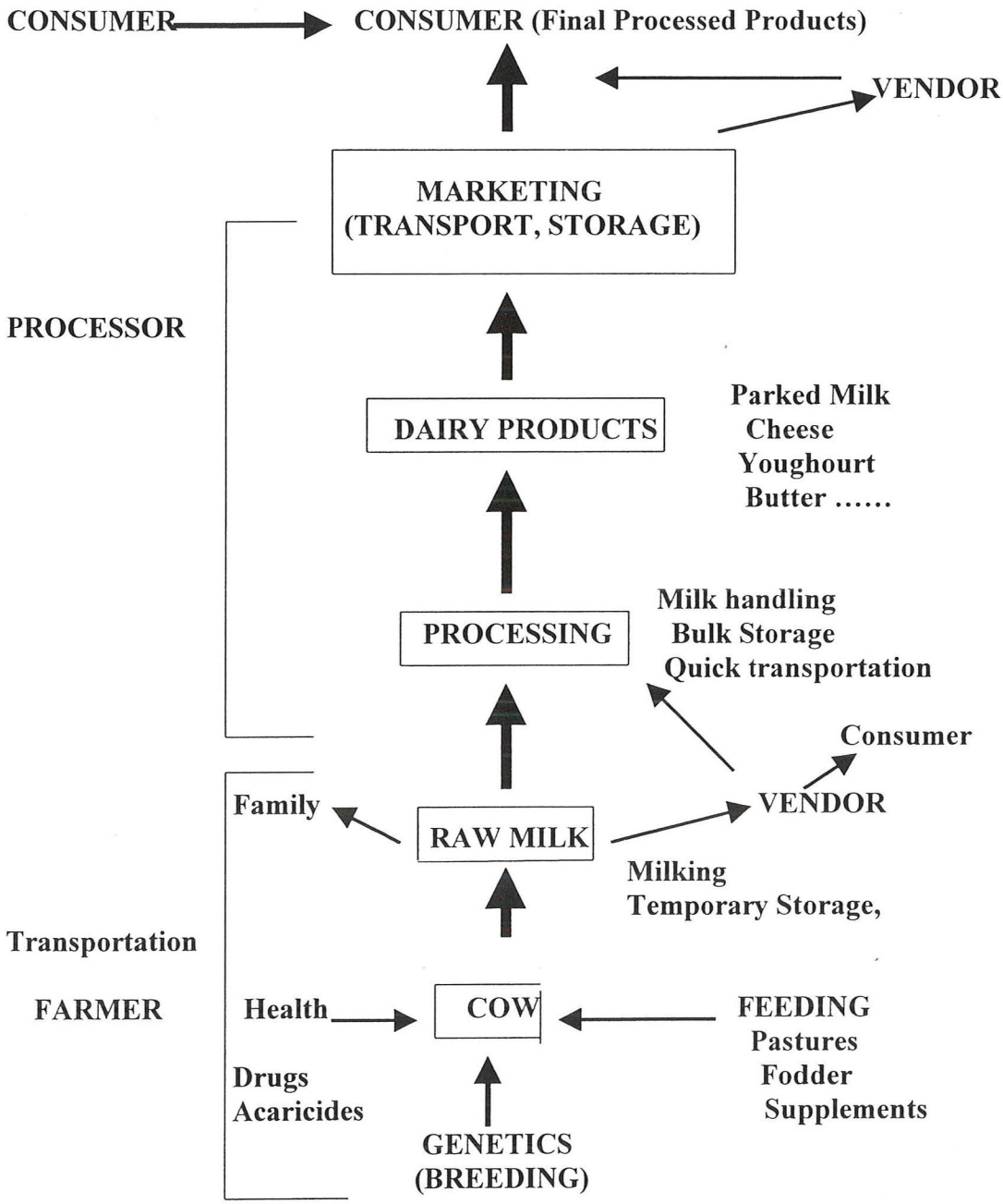
DAIRY PROCESSING COMPANIES

Company	Location	Installed Capacity ('000' ltrs)
1. Dairy Corporation	Kampala	130
2. Ra Milk	Mbarara	20
3. GBK	Mbarara	90
4. Jesa Mixed Farm	Busunju	15
5. Country Taste	Mbarara	25
6. Western Highland Creameries (Everfresh)	Mbarara	50
7. Dairy Bell	Fort Portal	10
8. White Nile Dairies	Jinja	10
9. Kaisa Fresh Milk	Kamuli	10
Total		360

MILK PRODUCTION PER DISTRICT

DISTRICT	1999 ('000' ltrs)
Apac	4,724
Arua	15,187
Bundibugyo	7,309
Bushenyi	56,733
Gulu	1,429
Hoima	9,799
Iganga	14,409
Jinja	2,885
Kabale	11,118
Kabarole	26,692
Kalangala	1,832
Kampala	2,975
Kamuli	25,556
Kapchorwa	4,178
Kasese	4,530
Kibaale	4,227
Kiboga	2,861
Kisoro	913
Kitgum	1,195
Kotido	42,189
Kumi	1,459
Lira	2,773
Luwero	10,366
Masaka	29,313
Masindi	7,013
Mbale	27,063
Mbarara	91,766
Moroto	66,718
Moyo	3,022
Mpigi	19,520
Mubende	18,809
Mukono	23,141
Nebbi	11,128
Ntungamo	18,564
Pallisa	10,977
Rakai	26,398
Rukungiri	11,997
Soroti	2,023
Tororo	14,998
TOTAL	637,789

MILK QUALITY CONTROL LADDER



To Res. Cmttee

RATIONALISATION OF TECHNIQUES AND BASELINE SURVEY ON QUALITY OF MILK AND DAIRY PRODUCTS IN MBARARA DISTRICT.

W. K. Isharaza, F. Byarugaba and M. Wesuta
Mbarara University of Science and Technology

INTRODUCTION

The proposed work is in pursuit of the French/MUST Milk Quality Control Project in Mbarara District. The project objectives are stipulated in the memorandum of understanding between MUST and the French Embassy in Uganda and the resolutions made during two workshops held in Mbarara in August and December 2000. Three specific recommendations in connection with this work are:-

- MUST should undertake studies to identify the hazard and quality control points in the milk delivery chain i.e. at farm level, during transportation, procesing and post processing and marketing.

- MUST should undertake research to identify key factors that affect milk quality properties e.g. processability maximum residue limits of acaricides and veterinary drugs, feed supplements, e.t.c.

- MUST jointly with CIRAD should establish activities focussed on addressing the hazard and quality critical control points in the "milk chain".

Most of the milk produced in Mbarara and neighbouring districts is sold in a raw unprocessed state directly to consumers or via milk vendors. Only a small fraction of the milk processed through dairy plants in Mbarara Municipality is put to local market.

Due to unstandardised milk handling procedures by different stakeholders in the production/distribution chain, the quality of milk is adversely affected. The long term overall objective of this project is to offer routine and regular services of milk quality control tests to all stakeholders in the dairy industry in Mbarara District. In preparation for realising this goal, preliminary work of this project will be to:

- rationalise the different milk quality control techniques to be used in the newly set up laboratory at MUST;

- conduct on baseline survey on the quality of raw milk and dairy products at different stages of production, processing and distribution chain before sale.

METHODS

1. MILK QUALITY CONTROL TESTS:

The following tests will be carried out to screen various milk samples collected from the field.

1.1. Platform tests (for rapid assessment of raw milk)

i) clot on boiling
ii) lactometry
iii) thermometry
iv) organoleptic tests.

1.2. Microbiological tests (for detection of contaminating organisms)

i) 10 minutes resazurin test (for qualitative detection of microorganisms).

ii) Alcohol test quantitative test for microbiology load.

iii) Total plate count test - a quantitative test for microbial load in milk.

iv) Total coliform test - specific for coliform spp.

v) Faecal coliform test to determine faecal contamination of milk.

vi) E.coli: test specific for these microorganisms.

vii) Staphylococcus aureus test specific for the sp.

viii) Gram/stain test for morphological identification of bacterial spp.

1.3 Serological tests for Brucellosis

i) Brucella agglutination test

ii) Milk ring test for Brucellosis.

1.4. Tuberculosis tests

i) Zn/stain

1.5. Antibiotic residues

Streptococcus thermophillus VI sensitivity test for antibiotics residues like penicillin.

(DETAILS OF RESPECTIVE TEST PROCEDURES, SEE APPENDICES I-III)

2. COLLECTION OF MILK SAMPLES

Milk quality can be compromised at different stages starting from the farm during milking through transport and processing before it is consumed. Milk samples will be collected at the various production and transportation/processing chain as follows:-

2.1. Fresh Farm milk

Milk collected at the dairy farms in study area immediately after milking cows. 50 farms will be selected randomly in Mbarara district.

2.2. Fresh raw milk from vendors

Milk vendors are individuals using cyclists who collect small quantities of milk from individual small scale farmers in a given locality and put it into milk cans and then transport it for sale either directly to consumers or at milk collection and colling centres.

Milk samples will be collected from vendors along the major transportation routes that converge into Mbarara town or other milk collection centres. These are Mbarara/Bushenyi, Mbarara/Ibanda, Mbarara/Masaka, Mbarara/Ntungamo.

2.3. Fresh milk from collection centres/cooling plants

There exists a chain of milk collection centres along truck roads mentioned in 2 above and in Mbarara town where milk from vendors and farmers is pooled in large quantities of 2000 – 5000litres. It is then sold directly to consumers or transported to processing plants in Mbarara or Kampala.

Processed milk and other dairy products

These products are available in groceries and shops in towns. They include:

i) Pasteurised and packaged milk from dairy processors.

ii) Youghourt from different cottage industries in Mbarara.
iii) Ghee and related dairy products

3. SCHEDULE OF ACTIVITIES

3.1. Time Schedule:

The initial phase of the project will be carried out every month per county for one year in order to cover all seasonal changes and other environmental factors that may influence milk quality both in production and handling.

The periods are:

March	-	May	Light rains
June	-	August	Dry season
September	-	November	Heavy rains
December	-	February	Dry spel.

3.2. Milk collection sites

County	No. Dairy farms	Vendors	M.C.C.*
Mbarara town	10	20	5
Kashari	10	20	5
Ibanda	10	20	3
Nyabushozi	10	20	4
Kazo	5 10	20	3
Rwampara	5 10	20	2
Isingiro	5 10	20	2

Bukanga

* Milk collection centres with cooling plants established by Dairy Co-orporation.

4. PERSONNEL

Project Co-ordinator	-	Prof. W. K. Isharaza (Biochemistry)
Co-Investigator	-	Dr. F. Byarugaba (Microbiology)
Co-Investigator	-	Mr. M. Wesuta (Biochemistry)
Technologists	-	Mr. E. Lwanga (Microbiology)
	-	Mr. J. Mwesigye (Microbiology)
Laboratory Assistants	-	(2)

5. BUDGET

1.	Storage Facilities		
1.1.	Refrigerators	2 x 1,000,000= =	2,000,000=
1.2.	Plastic milk bottles		200,000=
1.3.	Burners/sealers		150,000=
			2,350,000=
2.	Purchase of milk surples		
2.1.	Farmers: 10 x 7 x70 x 12 = 840 L @ 250=	=	210,000=
2.2.	Milk vendors 20 x 70 x 12 = 1,680 L @ 260=	=	436,800=
2.3.	Milk cooling centers 21 x 3 x 12 = 860 L x 300=	=	258,000=
2.4.	Pasteurised milk 100 L @ 500=	=	50,000=
2.5.	Others (Youghourt e.t.c.)	=	50,000=
			1,004,000=
3.	Transport		
3.1.	Motor vehicle (to be availed)		
3.2.	Fuel 30 L x 11 days x 12 months @ 1,480=	=	5,860,000=
3.3.	Motor vehicle services (5% fuel)	=	283,000=
			6,143,000=
4.	Personnel (Protective gear)		
4.1.	Field coats (overalls) 4 @ 20,000=	=	80,000=
4.2.	Laboratory coats 4 @ 25,000=	=	100,000=
4.3.	Gum boots 4 @ 15,000=	=	60,000=
			240,000=
5.	Personnel (Field allowances)		
5.1.	Safari day: 4 persons x 8days x 12months @ 5,000=		1,520,000=
5.2.	Per diem: 2 persons X 3days x 12months @ 48,000=		3,456,000=
5.3.	Per diem: 2 persons x 3 days x 12months @ 30,000=		2,600,000=
5.4.	Driver 1 x 3 days x 12 months		900,000=
			7,476,000=
6.	Laboratory Expandables		
	Detergents, cleaning materials		120,000=
7.	Office		
	Stationery and supplies		250,000=
	Secretarial services		240,000=
			490,000=

Budget summary

1.	Storage facilities	2,350,000=
2.	Milk purchase	1,004,000=
3.	Transport	6,143,000=
4.	Personnel (protective gear)	240,000=
5.	Personnel (field allowances)	7,476,000=
6.	Laboratory expendables	120,000=
7.	Office	490,000=
		16,823,000=

Budget justification

Item No.	Comments/Remarks
1.1-1.3	Essential for cold storage of milk samples and other laboratory reagents e.t.c.
2.1-2.5	Only a minimum of 1 L per sampling site. Price based on average in a year.
3.1-3.3	A vehicle is essential for field activities. There are seven counties in Mbarara to be covered. 30L of fuel per trip is average for return route.
4.1-4.3	Protective gear is essential.
5.1-	This caters for centres not far from MUST (i.e. Kashari, Rwampara, Isingiro & Mbarara Municipality).
5.2-5.4	Distant farms and vendors' routes in Ibanda, Nyabushozi and Kazo Sub-county. Investigators will spend at least 10 days per month of the working days on this project. This necessitates honararia for the extra working hours as specified in the project memorandum between French Embassy and MUST.
6	High standards of hygiene are essential in a milk analytical laboratory.
7	Data collection and processing in addition to correspondence with stakeholders in the programme.

MBARARA UNIVERSITY MILK PROJECT

RANGE OF TESTS AVAILABLE

1. PLATFORM TESTS

1.1. Lactometer Reading and Temperature measurement
1.2. Clot-on-boiling
1.3. Alcohol
1.4. 10min Resazurin
1.5. Peroxidase test?

2. CULTURE TESTS

2.1 Total plate count (TPC)
2.2 Enumeration of total coliforms

EQUIPMENT AVAILABLE

	ITEM	QTY
1.	Analytical balance	01
2.	Anaerobic Jar system	01
3.	Auto clave	02
4.	Incubator	03
5.	Blood cell counter	01
6.	Lactometer	02
7.	Microscope	01
8.	Oven	02
9.	pH meter	01
10.	Thermometer	13
11.	Vortex mixer	01
12.	Fridge/Freezer	01
13.	Water Bath	01
14.		

TESTS THAT CANNOT BE DONE DUE TO LACK OF CERTAIN ITEMS

	TEST	ITEM(S) LACKING/INADEQUATE
1.	Fecal Coliform Enumeration	Screw capped Durham tubes
2.	E.coli enumeration	Screw capped Durham tubes
3.	Salmonella detection	Media/chemicals (see sect. C attached) C14
4.	Staphylococcus	Medium components C6,18,19
5.	Yeast and Molds	Medium 15,16,17
6.	Brucella N.B. see separate sheet (4) for items needed.	C12, 13

7. Peroxidase.

8. Phosphatase test for pasteurized milk

ITEMS LACKING

A.	EQUIPMENT	QTY Available	QTY Required	REMARKS
1.	Colony counter	None	01	
2.	Pipette canisters	None	06	
3.	Petri dish canisters	None	06	
4.	Incubator with shaker	None	01	
5.	Oven	02	01	Available ovens are small
6.	Autoclave	02	01	Available autoclaves are small
7.	Air conditioner	01		
8.	Fridge	01	01	
9.	Water still	01	01	
10.	Deioniser	none	01	
11.	Water testing kits	none	01	
B.	GLASSWARE			
1.	Durham tubes	98	400 pcs	
2.	Screw capped tubes	137	400 pcs	
3.	Universal bottles	212	300 pcs	
4.	Bijou bottles	100	200 pcs	
5.	Sample bottles, autoclavable	20 pcs	50 pcs	
6.	Filter paper, ϕ 30 cm	none	02 pkts	
7.	Filter paper, ϕ 18.5 cm	none	04 pkts	
8.	Petri dishes, glass	140 pairs	100 pairs	
9.	Wire loops	10 pcs	10 pcs	
10.	Loop holders	none	05 pcs	
C.	MEDIA AND CHEMICALS			
1.	Bismuth sulphite Agar	none	500 g.	
2.	Hektoen Enteric Agar	none	500 g.	
3.	Xylose Lysine Desoxycholate Agar	none	500 g.	
4.	Triple sugar Iron Agar	none	500 g.	
5.	Lysine Iron Agar	none	500 g.	
6.	Lactose Broth	none	500 g.	
7.	Urea Broth	none	500 g.	

		available/required	
8.	Sterile Urea solution 40%	none	100 x 5 ml
9.	Salmonella polyvalent antiserum for S.typhi, S.paratyphi A,B,C	none	2 kits
10.	Selenite Cystine broth	none	500 g.
11.	Tetrathionate broth	none	500 g.
12.	Brucella antigen suspension (Rose bengal)	none	100 ml
13.	Brucella antigen for milk ring test	none	100ml
~~14.~~	~~SS~~ Agar	none	~~500~~ g.
15.	Peptone Water	none	500 g.
16.	Potato dextrose Agar with Chlortetracycline	none	500 g.
17.	Dichloran Rose bengal Agar	none	500 g.
18.	Egg-Yolk emulsion	none	50 x 50 ml
19.	Potassium tellurite	none	500 g.

MILK TESTING LABORATORY
CHEMICAL STOCK

CHEMICAL NO	NAME	MANUFAC-TURER	LOT/BATCH/ PRODUCT NO.	DATE RECEIVED	EXPIRY	QUANTITY	LOCATION
CH001	4-Dimethyl Amino benzaldehyde	PARK SCIENTI-FIC	P 492 C	02.2001		25 g	
CH002	Ethanol	BDH	L937204	02.2001		1L	
CH003	Hydrogen Peroxide 30% W/W Soln.	SIGMA	53H3353	02.2001		100 ml	
CH004	Methylene Blue	UNILAB	CI.52015	08.2000		25 g	
CH005	Methyl Red	BDH	21022	02.2001		500 ml	
CH006	1-Naphthol	BDH	L217795.528	02.2001		100g	
CH007	Potassium dihydrogen orthophosphate	BDH	10203	02.2001		500g	
CH008	Potassium hydroxide	UNILAB	106192	02.2001		500g	
CH009	Resazurin Tablets	BDH	2723	02.2001		100 tabs	
CH010	Xylene	ET Monks	A895106	02.2001		2.5L	
CH011	Sodium hydroxide	SIGMA	103H0829	07.2001		1 X 500G	
CH012	Ethanol			08.2001		2.5L	
CH013	Lysol			08.2001		5L	
CH014	Potassium dichromate			08.2001		500g	
CH015	Potassium dihydrogen Phosphate			08.2001		500g	
CH016	Resazurin tabs	BDH		08.2001		100 tabs	
CH017	Resazurin tabs	BDH		08.2001		100 tabs	
CH018	Sodium hydroxide			08.2001		500g	
CH019	Sulphuric acid			08.2001		2.5L	
CH020	Xylene			08.2001		2.5L	

MILK TESTING LABORATORY EQUIPMENT INVENTORY

NO.	ITEM	MAKE	MODEL	SERIAL NUMBER	QTY	REMARKS
MTL.02.01	Analytical bal.	Bioblock	LB1500	169071184	01	
MTL.02.02	Anaerobic Jar	Gen Box	96127	743525801	01	
MTL.02.03	Autoclave	Sanoclav	Las-20-1	A143401	01	
MTL.02.04	Bunsen Burner				01	
MTL.02.05	Cold Boxes	Cosmoplast			05	
MTL.02.06	Gas Cylinder	Shell			01	
MTL.02.07	Incubator	Memmert	UM.100	b.195.0186	01	
MTL.02.08	Incubator	Memmert	UM.100	b.195.0354	01	
MTL.02.09	Incubator	Memmert	BE 400	e400.0754	01	
MTL.02.10	Lactometer				02	
MTL.02.11	Microscope	Zeiss		182468	01	
MTL.02.12	Oven	Memmert	SM 100	b.196.355	01	
MTL.02.13	pH Meter	Cyberscan	Ph500	82193	01	
MTL.02.15	Thermometer	Zeal			04	
MTL.02.16	Thermometer -10-100^{0}C				06	
MTL.02.17	Vortex Mixer	Velp.Scientifica		4992208	01	
MTL.02.18	Water Bath	Clifton		39308	01	
MTL.02.19	Electronic Clock/Timer	Hanhart		9262071	01	
MTL.02.14	Refrigerator	Venus	VG-185C	IE01570021	01	
MTL.02.20	Autoclave	Oswal, India			01	
MTL.02.21	Blood Cell Counter				01	
MTL.02.22	Oven	Supertek,			01	
MTL.02.23	Thermometer 0-250^{0}C	India			03	

MILK TESTING LABORATORY

FURNITURE

MILK TESTING LABORATORY

FURNITURE

NO.	ITEM	QTY
MTL.01.01	Working bench, portable	01
MTL.01.02	Laboratory stools	04
MTL.01.03	Office chairs	01
MTL.01.04	Office desk	01

MILK TESTING LABORATORY
GLASSWARE INVENTORY AS AT 04/09/2001

	ITEM DESCRIPTION		QTY	
1.	Boiling tubes		50 pcs	
2.	Beakers	50 ml	10 pcs	
3.	Beakers	100 ml	10 pcs	
4.	Beakers	250 ml	10 pcs	
5.	Beakers	500 ml	09 pcs	
6.	Beakers	1000 ml	05 pcs	
7.	Beakers	2000 ml	01 pcs	
8.	Conical flasks	50 ml	10 pcs	
9.	Conical flasks	100 ml	05 pcs	
10.	Conical flasks	250 ml	05 pcs	
11.	Conical flasks	500 ml	15 pcs	
12.	Conical flasks	1000 ml	12 pcs	
13.	Durham tubes		98 pcs	
14.	Measuring cylinders	150 ml	02 pcs	Graduated in BTU
15.	Measuring cylinders	100 ml	02 pcs	
16.	Measuring cylinders	250 ml	02 pcs	
17.	Media bottles	500 ml	09 pcs	
18.	Pasteur pipettes, with bulbs		10 pcs	
19.	Pipettes	1 ml	30 pcs	
20.	Pipettes	2 ml	30 pcs	
21.	Pipettes	5 ml	20 pcs	
22.	Pipettes	10 ml, one mark	40 pcs	
23.	Petri dishes, glass		140 pcs	
24.	Test tubes, ordinary		70 pcs	
25.	Test tubes with screw caps		137 pcs	
26.	Universal bottles, 20 ml		212 pcs	
27.	Sample bottles, 1000ml		20 pcs	
28.	Bijou bottles		100 pcs	
29.	Petri dishes, disposable		100 pcs	
30.	Pipette fillers		05 pcs	
31.	Cover slips		10 pkts	

MILK TESTING LABORATORY

MEDIA STOCK, JULY 2001

MEDIA NO.	NAME	MANUFACTURER	BATCH/LOTNO	DATE RECEIVED	EXPIRY DATE	QTY	DATE OPENED	LOCATION
M001	Plate count Agar	Hi Media	BH057 M091	09 2000	09 2003	500g		
M002	Plate Count Agar	Hi Media	BH057 M091	09 2000	09 2003	500g		
M003	Plate Count Agar	OXOID	CM325 200826	02 2001	12. 2002	500g		
M004	Baird Parker Agar	MERCK	V315306 910	02 2001	11.03.2004	500g		
M005	Brain Heart Infusion Broth	BIOTEC	022525	02 2001	12.2004	500g		
M006	Brilliant Green bile-lactose broth	MERCK	V312754 910	02 2001	04.03.2002	500g		
M007	EC Broth	MERCK	V723965 551	02 2001	19.12.2004	500g		
M008	Lauryl Tryptose Broth	DIFCO	F3D KQRXA	02 2001	01.06.2004	500g		
M009	L-EMB	LAB M	026252	02 2001	--	500g		
M010	MRVP Broth	MERCK	V216812 832	02 2001	30.07.2003	500g		
M011	Simmon's Citrate Broth	BIOTEC	046790	02 2001	02.2003	500g		
M012	Trytone Soya Agar	OXOID	CM131 201617	02 2001	06.2003	500g		
M013	Tryptone Water	MERCK	--	02 2001	--	500g		

MR. WESUTA'S OFFICE FURNITURE

	ITEM	QUANTITY
1.	Office desk	02
2.	Office chairs	02
3.	Book shelves	02

EQUIPMENT

ITEM	MAKE	MODEL	SERIAL NO.	QTY
1. Deep freezer	SUPRA	SGF 625	62585306/10	01

Annexe 2 – C

Documents « Countrytaste »

JKm.

COMPLIMENTARY COPY ISSUED BY

COUNTRYTASTE (U) LTD

PROCESSORS OF FRESH
PASTEURISED AND HOMOGENISED
PURE COW'S MILK.

COUNTRYTASTE

MANUAL FOR PRODUCTION OF GOOD QUALITY MILK

COUNTRYTASTE (U) LTD.
P.O. BOX 849
FORT PORTAL ROAD, MBARARA
TEL: 0485/21307 FAX: 21308

COMPILED BY JAMES KABATERANA

COUNTRYTASTE FRESH COW'S MILK

(A) The Principles:

Milk should have pleasing flavour, and be uniformly palatable. Milk may acquire, flavours from certain strong smelling materials by absorption from foul air where milking is taking place. At storage, by inhalation *of* foul air by cows confined in poorly ventilated barns, by secretory transfer to milk by cows that have eaten strong smelling feeds shortly before milking. Smell could come from bacterial changes, from light exposure, contact with certain metallic equipments or other chemical changes taking place during handling, holding and distribution. Therefore, at the receiving end *or* at the farm, certain tests are carried out to ascertain the milk quality status.

(B) Selecting a Dairy Cow

Look at the form, the type *or* the general appearance, the records for performance in milk and milk fat could be *of* value in selection *of* the dairy animal keepers prefer. The dairy animal characteristics, look at the body capacity, mammary system, and alertness. These are factors to be considered. On selection for the type *of* breed to be selected the order *of* high milk producers be looked into. The Fresian Weighs, 500-600 kg Body Wt, Hereford 550 kg, Aryshire 450 kg, Guernesey 410 kg, Jersay 350 kg, The reverse is true for milk fat and milk quantity. In our conditions the crosses *of* the above are hardy and can survive under difficult *or* poor management condition.
Farmers should contact their veterinary office about which breed is best for their purpose and area.

(C) Breeding

Good uniform level *of* feeding leads to better heifer, Bull, growth. A well fed Heifer should calve at 2 years age when it has attained 2/3 body weight *of* the breed. While dairy bulls may be used for light service at 1 year old, from 2 years, until 8 years, bulls may be used heavily. With natural service an active bull is kept for every 50 to 60 cows on fenced farms. Artificial insemination using pedigree animalq is practised in order to get increased milk. An animal should produce a calf every 12 months if bred after 3 months of calving. Allowance of a dry period of 6 to 8 weeks is necessary to allow building of body reserves depleted during lactation.

(D) **Signs of heat**

There is a temporay drop in milk, restlessness and aloofness, bellowing, excites other cows to mount and stands to be mounted, swollen and reddened vulva lips, a clear thin mucous discharge, hanging from the vulva or adhering to the tail. Timing is important when using A.I, because heat lasts 6 - 30 hrs. This is when insemination should take place. The circle is repeated 18 - 21 days every month.

(E) **Management Practices**

If you have unwanted bulls let them be castrated early enough, hooves trimmed extra teats be removed ; Horns cause damage and wounds and require twice as much water trough space, encourage disbudding ; Apply strategic deworming when rains begin and at the start of the dry season in order to reduce the worms burden.

(F) **Diseases**

Do proper tick control and vaccination against important diseases. In tick control, diseases are transmitted from infected animals to healthy ones by ticks bite. The most important tick - borne diseases are : East coast fever, Anaplasmosis, Redwater and Heart water. The control of ticks can be carried out by dipping, spraying and hand dressing. Hand dressing application is confined to particular tick attachment sites. Acaricides commonly used are : Supona, Stelladone, Decafix, Tactic and pour on. Other diseases of importance that have vaccines are Anthrax, Blackquater, C.B.P.P., Foot and Mouth Disease Rabies, Rinderpest, Tuberculosis, and Bruœllosis. There are nutritional diseases and breeding diseases of importance in dairy animal that reduce an animal's ability to give milk.

(G) **Water Supply/Feeding**

90% of milk is water. Dairy cows take 35 Its plus 3 Its per litre of milk produced per day. The drinking place should not be dirty or muddy, a clean area is required for watering cattle. Water from roofs, and farm houses can provide good clean water if harvested. Dam catchment area be grassed up stream, the embankment and other bare areas be grassed to limit siltation. It is better to water animals in cemented water troughs if possible. Cattle should be grazed on improved pastures, grass and legumes with fodder grasses, higher stocking rates are possible because of increased quantity of feed available throughout the year, but need a lot of water. Farm irrigation is also possible if there is adequate reliable source of water.

(H) **Zero Grazing**

Cows are confined in a shed or yard. The system is highly productive but rather labour intensive since forage must be cut in the field and transported to cattle.

Napier grass, green maize, by-products of sweet potatoes vines, sweet potato tubers and banana stem are fed to milking animals. Feeding good fooder, and concentrates to a dairy cow can produce 8 Kg of milk and above provided there exists the genetic potential for milk production.

(I) Milking

High standards of Hygiene are a key factor in milk production. Milk should be clean, sweet, wholesome free tram objectionable odours and flavours to prevent spread of diseases. Under warm conditions, bacteria in milk tend to multiply faster. Bacteria in milk are introduced under unhygienic conditions like dirty containers used in milking, badly washed utensils, animal hairs, etc.. Clean milk production is attained under good conditions like : milk shed, people suffering from infectious diseases should not milk, Cows suffering from Mastitis should be milked last and the first milk drawn from the teat be thrown away because it has high bacterial count. The use of teat dip with an antiseptic be employed. Let milk be filtered and be stored in a cool place. The milking utensils should be well cleaned, rinsed with clean water and be dried on a clean rack.

(J) Milking Techniques

Make sure you milk at regular intervals, morning and evening. Milk in a quiet place, milk quickly, evenly and empty the udder at each milking time. Milk let down lasts 5 - 7 minutes, so quick efficient milking is required in order to get out all the milk in the udder. Milk yield reaches maximum 3 - 10 weeks after calving then decreases over 8 -10 months period.

Steps :

(i) Wash Hands & Arms with soap
(ii) Wash Udder with warm water with a Disinfectant.
(iii) Dry the Udder with a clean cloth
(iv) Milk the first few drops and throw away.
(v) Continue to milk all the milk.

(K) Milk handling, Transportation and Acidity

Milk kept at low temperatures may retain ifs qua lit y longer. High temperatures cause multiplication of bacteria, which in turn produce acid that spoils the milk quality.

Transportation of milk should be done in clean containers, covered, and in cool conditions where refrigeration is not possible. High levels of acidity lead milk to go sour due to bacterial action. Bacteria originate from unhygienic conditions, like dirt falling into milk containers, containers which are poorly washed. Traces of salt in milk cause milk o go sour and reduces its quality. Therefore take care

to prevent the contamination of milk due to the above reasons for better milk quality.

(L) Milk Tests

The milk tests are necessary because they provide information and general knowledge on the quality of milk. There are microbiological tests and chemicals tests, most of these tests require well - equipped laboratories, and are important in dairies which produce other products from the milk, like butter and cheese. To carry out tests that suit the milk collecting centres and at the farm, more simple platform tests and chemical tests are selected because they provide essential information on the quality of milk. They are easy and simple to carry out; they do not require advanced equipments which most centres and farms do not have nor the capacity to handle such tests. However, Alcohol test, Clot - on - Boiling test, 10 minutes Resazurin and Titratable acidity all provide information on the stability of the milk hence, how far the bacteriological degradation has gone. These tests are :

1. Organoleptic test.
2. Specific gravity test
3. Alcohol test
4. 10 Min Resazurin test
5. Clot-on-boiling test
6. Sediment test
7. Titratable acidity test

Some of the above tests are needed at the spot in order to rapidly segregate the poor milk from the good milk. The senses of smell, taste and sight are easy and must be familiarized by training in use of the above senses. One will be able to judge with fairly high accuracy in determining the milk quality.

N.B. Shake immediately Do not allow the tube to stand still after mixing.

BRIEF EXPLANATION ON THE TESTS LISTED BELOW

1. ORGANOLEPTIC TEST

a) Organoleptic test for microbiological growth souring, malt, bitter, blue-souring, fruit-like, slimy milk, phenol and bubbles separation.
b) Chemical changes for salt, boiled milk, rancidit and tallow.
c) Cattle feeds off-flavours, caused by feed stuffs e.g. beets, garlic, anions, bad silage, certain plants and pastures. It is strongest if the feeding was 1-3 hours before milking
d) Absorption of off-flavours from the air and containers.

It is a test which is carried using the normal senses of smell, taste, sight, so as to get good quality of raw milk and milk products. It is a test which is applied on the farm, milk collecting centres and the plant.

HOW IT IS DONE :

By use of the sense of smell. Open the can lid, lower the nostrils down to the milk and detect the smell. It should give a good pleasant smell to qualify as good milk.

2. SPECIFIC GRAVITY / LACTOMETER/ DENSITY TEST :

The test is done for :

a) Sub-standard in total solids content
b) Added water
c) Fats removed from natural milk
d) Added skim milk (fluid or concentrated)

HOW IT IS DONE :

Water, whole milk and skim milk have different specific gravity. By recording specific gravity of the milk. The lactometre reading will tell the composition of the milk quality.

It is determined by measuring a certain volume of milk and its corresponding weight of that volume. A representative sample of milk is measured and a lactometer is put in, to float freely. Then a reading is taken against the lactometer and the temperature of the milk.

N.B. Lactometer reading has to corrected

3. ALCOHOL TEST

To ascertain immediate acidity level in milk. The proteins become susceptible to alcohol precipitation. To detect colostrum which is alcohol positive, milk from mammary irritated tissues, or inflamed tissues are alcohol positive

It is a test which records the microbiological quality of the milk. It is also a test which is carried on the platform just like clot on boiling test before milk is accepted, weighed and recorded.

HOW IT IS DONE :

Get equal small amount of milk preferably 2 mls using pipette each and put or mix with an equal volume of alcohol in a test tube. You immediately mix the contents by gentle shaking where after the results can be observed instantly.

RESULTS

If there is no reaction by the alcohol test, the milk can be considered fit for heating/Pasteurisation. But if there is any reaction, then the milk is not fit for heating. If there are some tresses of Coagulation, Grinning, Precipitation and Thickening, along the inner walls of the test tube, then the milk is not suitable for Pasteurisation and should not be accepted.

4. 10 MINUTES RESAZURIN TEST

It is used to detect the activity of organisms in the milk. This test aims at establishing the bacteriological conditions of the milk and it also gives you an idea of body cells of the animal that have found their way into the milk for example if the animal is having mastitis (disease). Resazurin is a dye which has got a redoxide potential and also is able to change colours through a series of biochemical reactions due to metabolic activities of micro organisms; where by some gases are produced like : Hydrogen, carbondioxide, Nitrogen and Oxygen. This dye is reduced and oxidised from blue through very light pink to pink and the end point being colourless.

HOW TO PERFORM THE TEST

Make fresh solutions of resazurin by dissolving one standard tablet of resazurin in 50 mls of distilled water.

Put 10 mls of representative sample of milk in a sterile test tube, to the sample in a test tube, add one ml of freshly prepared solutions of resazurin and mix gently.

Incubate the mixture Resazurin and the sample at 37 c for 10 minutes.

RESULTS

The results are interpreted in the following way:

DISC.NO	COLOUR	QUALITY OF MILK	INTERPRETATIO? OF RESULTS
6	BLUE	EXCELLENT	ACCEPTABLE
5	LILAC	GOOD	ACCEPTABLE
4	MAUVE	FAIR	ACCEPTABLE
3	PINK MAUVE	POOR	ACCEPTABLE
2	PURPLISH PINK	BAD	REJECTED
1	PINK	VERY BAD	REJECTED
0	COLOUR LESS	VERY BAD	REJECT

5. CLOT ON BOILING TEST

To test for degree of acidity in the milk, the microbiological quality of milk could be ascertained.

It is also like the alcohol test, recording the micro-biological state of the milk. In other wards measuring the degrees of acidity of milk. It is used (test) at the milk collecting points as an alternative to an alcohol test before the milk is accepted, weighed and recorded. It is believed that milk which clot on boiling is no longer a marketable product.

HOW TO CARRY THE TEST

A small amount of milk preferably 2 mls is put in a test tube and boiled over a Busen flame or spirit lamp. The result will show immediately. If on coagulation has taken place, that indicates the milk can stand heating operations at the time of being tested.

RESULTS

The milk is rejected if there is (1) coagulation, (2) precipictation, Thickening and graining.

6. SEDIMENT TEST

To detect solids like dust, soot, fibre, dung, feeds, hairs, blood clots and udder tissues.

Visible dirt considerably reduces consumer desire and confidence. The presence of dirt in the milk is an evidence that improvement is necessary regarding the conditions under which the .milk is produced and handled.

Filtration or straining on the farm is often performed immediately after milking using a sieve made of stainless steel or filtering cloth and if test the is carried at the plant, the filtering pad is used only once.

HOW TO CARRY THE TEST (Procedure)

A filtering cloth or sieve is fitted on the can and a measured amount of milk is poured through the filtering cloth or sieve and insoluble contaminants of milk are collected. Fiber, dung, dust, pus and blood etc. The filtering cloth is used for a short time and when it becomes dirty, it is removed and another one is used.

7. TITRATABLE ACIDITY

It helps to quantify the acidity of the milk, the state of the milk and its keeping qualities when used with resazurin test.

The principal behind the test is that mixing milk with concentrated sulphuric acid will cause destruction and dissolving of protein then releasing fat. The addition of amyl alcohol is contrifugated for 5 minutes at a speed of 1100 revolutions per minute. After 5 minutes the results of the test can be read directly.

HOW TO PERFORM THE TEST

Measure with the appropriate pipette or automatic measure, 10 mls of sulphiric acid into butyrometer tube

- On top of the acid, run in slowly 10.725 mls of milk allowing it to form undistrubed layer without being mixed with the acid.
- Run in one ml of amyl alcohol on top of the milk.
- Insert the stopper fully without shaking.
- Shake the tube contents by holding the tube stem with the stopper pointing up wards. Invert the tube contents for several times so that the contents are evenly distributed inside the butyrometer,
- Place the marked tubes in the holding sleeves of the centrifuge with the stoppers pointing outwards.

Note : The distribution of the tubes should be even so that the centrifuge is perfectly balanced.

(M) RECORDS

They are necessary because they help management and financial control, selection of breeding stock, time for vaccination, weaning, marketing changes, feeds changes, fertility problems, when to deworm, date of heat periods, bulls used , dates of calving, milk yields and lactation length etc.

All the above points determine the profitability of the farm enterprise, lead to making plans for milk sales, income, expenses and priority action plan for yearly calender farming.

ANNEXE 3

Dairy Development Authority (DDA)

DAIRY DEVELOPMENT AUTHORITY (DDA)

Plot 1 Kimathi Avenue
P.O. Box 34006, Kampala-Uganda

Tel: Gen: 256-41-343901, 343903
Tel: 343883 - Executive Director
Fax: 256-41-250270
E-mail dda@afsat.com

Ref. DDA/MKT/3/01

3rd October, 2001

Prof. W.K. Isharaza,
Mbarara University of Science and Technology,
P.O. Box 1410,
MBARARA.

Dear Sir,

LABORATORY FACILITIES FOR MILK QUALITY AT MUST

I wish to refer to your letter dated 26th September 2001 on the above subject.

In carrying out its regulatory services, DDA intends to work closely with all stakeholders in the Dairy Industry. DDA will also endeavour to utilise under agreed terms any relevant facilities available in the Country. The offer extended by MUST to DDA to use the laboratory is a welcome gesture.

In this regard DDA has decided to send three officials from its Regulatory Services Department led by Mr. R. Walimbwa to look at the laboratory and possibly discuss with your officers the way forward. The team will be at your offices on Thursday 4th October, 2001 in the morning.

Any assistance accorded to them will be highly appreciated.

Yours faithfully,

Dr. N. Twinamasiko
EXECUTIVE DIRECTOR

c.c. Vice Chancellor,
MUST, MBARARA.

ANNEXE 3

8 October, 2001

MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY
LABORATORY ASSESSMENT REPORT

INTRODUCTION

DAIRY DEVELOPMENT AUTHORITY (DDA) has well intended objectives among which is to Regulate and Control Market for Milk and Dairy products and to promote production and compe1ition therein. To achieve this objective, there is a need for monitoring milk and milk products. Therefore DDA decided to have milk samples analyzed in bath accredited and non-accredited laboratories in order to give the indication of the status of implementation of the Quality and Monitoring program. In its maiden attempt, a team from DDA was sent to Mbarara University of Science and Technology (MUST) assess the capability of the MUST Laboratory facility in analyzing milk samples.

PURPOSE OF THE VISIT

To assess the laboratory facility at MUST

OPENING MEETING

MUST has got a laboratory given as a grant worth 15 million by a French Support group called "SUMPCA" **with the objective of controlling animal** to human diseases transmitted through milk e.g. Tuberculosis and Brucellosis. However Prof. Isharaza made some contacts with DDA to find out if they could also be interested in using the same facility to analyze milk either for regular monitoring or as reference laboratory.

Prof. Isharaza highlighted that the laboratory may not be having all the needed equipment but if there is justification for other tests by DDA that would contact potential donors to have it fully equipped and employ more technicians.

About the current capacity, Prof. Said chat it may be limited but in case of a short notice, they can put a side their regular work and have DDA's done in time.

About costs for analysis. Prof. Said that the extra load will definitely justify some payments to buy the media and motivate staff but will have to be as low as possible compared to commercial laboratories.

AREAS Of INTEREST FOR ANALYSIS BY DDA

1. Raw milk tests to check for adulteration and suitability for processing
2. Process products, to check their suitability for human consumption in Uganda and export market
3. Imported milk and milk products especially from suspected areas or those suspected unfit for Human consumption.

FINDINGS AT MUST LABORATORY

Personnel availability

The laboratory has two technicians Mr. MWESIGYE James and Mr. NKANGI LWANGA qualified by scientific training in laboratory techniques with related work experience of 10 and 20 years respectively.

RANGE OF TESTS CONDUCTED ON MII.K

1. PLA TFORM TESTS
   - 1.1 Lactometer reading and temperature measurement
   - 1.2 Clot-on-boiling
   - 1.3 Alcohol
   - 1.4 10 min. Resazurin
   - 1.5 Peroxidase test

2. CULTURE TESTS
   - 2.1 Total plate count (TPC)
   - 2.2. Enumeration of total coliforms

MICROBIAL TESTS THAT CONNOT BE DONE BUT REQUIRED BY DDA

Test	Items lacking/inadequate
Fecal coliforms enwneration	Screw capped Durhan tubes
E.coli enumeration	Screw capped Durhan tubes
Salmonella detection	Media/chemicals
Staphylococcus	Medium components
Yeast and Molds	Medium
Brucella	Brucella antigen suspension (Rose bengal), Brucell antigen for milk ring test

OTHER TESTS THAT CANNOT BE DONE

Detection of pharmacologically active compounds like tetracycline, penicillin, and chlorophenical classified as antibiotics.

Detection of heavy metals from radioactive isotopes

Residual chlorine and iodophores.

Attended:

1 Prof. W. Isharaza. Head Biochemistry , MUST
2 Mr. R. Walimbwa. Regulations service Manager, DDA
3 Mr. I. Muzira, Monitoring & Quality Control Officer, DDA
4 Ms. H. Namuli, Laboratory Technician, DDA
5 Mr. J. Mwesigye, Laboratory Technician, MUST
6 Mr. Nkangi Lwanga, Laboratory Technician, MUST

DAIRY PROCESSING COMPANIES

COMPANY	LOCATION	INSTALLED CAPACITY (000 LITRES)
Country Taste	Mbarara	25
Dairy Corporation	Kampala	130
GBK Dairy	Mbarara	90
Jesa Mixed Farm	Busunju	15
Kaisa Fresh Milk	Busunju	10
White Nile Dairies	Jinja	10
TOTAL		280

DAIRY PRODUCTS MADE IN UGANDA

MILK PRODUCTION PER DISTRICT

DISTRICT	2000 (000Liters)
APAC	4,867
ARUA	15,663
BUNDIBUGYO	7,528
BUSHENYI	65,901
GULU	1,472
HOIMA	11,157
IGANGA	14,912
JINJA	3,009
KABALE	12,720
KABAROLE	30,734
KALANGALA	1,894
KAMPALA	3,102
KAMULI	26,387
KAPCHORWA	4,311
KASESE	4,709
KIBAALE	4,386
KIBOGA	2,968
KISORO	942
KITGUM	1,231
KOTIDO	43,455
KUMI	1,503
LIRA	2,858
LUWERO	11,778
MASAKA	33,318
MASINDI	7,279
MBALE	30,921
MBABARA	105,062
MOROTO	68,719
MOYO	3,113
MPIGI	22,212
MUBENDE	21,476
MUKONO	26,743
NEBBI	11,465
NTUNGAMO	21,185
PALLISA	11,306
RAKAI	29,917
RUKUNGIRI	12,480
SOROTI	2,083
TORORO	15,448

DDA

DAIRY DEVELOPMENT AUTHORITY

MILK

FOR SUSTAINABLE DAIRY INDUSTRY

DAIRY DEVELOPMENT AUTHORITY

For a dynamic, regulated, profitable and sustainable Dairy Industry.

4th FLOOR, CRUSADER HOUSE, PORTAL AVENUE,
P.O. BOX 34006 KAMPALA, UGANDA

DDA OBJECTIVES AND FUNCTIONS

1. The objectives of the Dairy Development Authority are to provide proper coordination and efficient implementation of all policies designed to achieve and maintain self sufficiency in the production of milk in Uganda by promoting production and competition in the dairy industry and monitoring the market for milk and dairy products.

2. The Dairy Development Authority facilitates the dairy industry:

- To raise the incomes and standard of living of small-scale farmers through increased and continuous returns in dairy farming.
- To achieve and maintain self-sufficency in milk and dairy products and to export any surplus.
- To promote increased dairy productivity with the use of available cost effective technologies and to foster its sustainability with due regard to cordial environmental equilibrium.
- To establish liberal but harmonised dairy markets and to promote competition in milk collection, processing and marketing.
- To regulate and control market for milk and dairy products and to promote production and competition therein.
- To improve human resources capacity for the development of the dairy sector.

3. For the attainment of its objectives, the Authority.

- Registers and licenses milk processors and traders.
- Supports dairy farmers' marketing organisations.
- Registers dairy farmers' marketing organisations.
- Advises Government on milk standards and coordinates the enforcement of those standards in liaison with the Uganda National Bureau of Standards.
- Controls and regulates dairy and dairy related import and export activities in conformity with the External Trade Act, but without violating the Animal Diseases Act.
- Implements Government policies designed to promote the development of the dairy sector.
- Supports various dairy development activities such as dairy extension, breeding. research, training, dairy products development & general market promotion including dairy export.
- Acts as an arbitrator in any conflict between dairy companies and processors.
- Coordinates all dairy processing and marketing promotional activities.
- Pools dairy processing and marketing data.
- Advises Government on research priorities of the dairy sectors. Does anything connected with, or necessary for the performance of the foregoing duties.

DAIRY INDUSTRY AT A GLANCE (2000)

CATTLE POPULATION

Indigenous	5.6
Exotic & Crosses	0.278
Total	5.878

Annual milk production	700 litres
Per capita consumption	30 litres
WHO recommended per capita consumption	200 litres

AVERAGE MILK COMPOSITION

Butter Fat	4.0%
Solids Non fat	8.5%
Total solids	12.5%
Density	1.030%

MILK MARKETING AND CONSUMPTION HABITS

Farm families consume 5O-70% of milk produced.

Of the marketed milk, 10% is packaged and 90% sold in loose form.

Main milk markets : Urban Centres.

ANNEXE 4

Standards UNBS

US 21 CS 11 : 1993
UDC 637.146.34

UGANDA STANDARD

Standard Specification

for

Yoghurt and Sweetened Yoghurt

First Edition: APRIL 1993

UGANDA NATIONAL BUREAU OF STANDARDS

PRICE GROUP

Descriptors: quality, raw materials, additives, labelling.

US 8-CS 5 : 1993
UDC 637.143:543.05:638.788.4

UGANDA STANDARD

Standard Specification

for

Whole Milk Powder, Partly Skimmed Milk Powder and Skimmed Milk Powder

First Edition: APRIL 1993

UGANDA NATIONAL BUREAU OF STANDARDS

PRICE GROUP

Descriptors: milk, dried milk, dairy products, dried foods, powdered foods, processed foods, food products, food additives, analysis and sampling, labelling.

US 227:2000
EAS 164
ISO 2446

UGANDA STANDARD

Milk —
Determination of fat content (Routine method)

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: milk, chemical analysis, determination of content, fats, butyrometric method.

ICS 67.100.01

US 226:2000
EAS 163
ISO 5764

UGANDA STANDARD

Milk –

Determination of freezing point – Thermistor cryoscope method

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: agricultural products, food products, dairy products, milk, creams, condensed milk, determination of content, solids, dry matter,

ICS 67.100.01

US 225:2000
EAS 162
ISO 6731

UGANDA STANDARD

Milk, cream and evaporated milk —

Determination of total solids content (Reference method)

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: agricultural products, food products, dairy products, milk, cream, condensed milk, determination of content, solids, dry matter

ICS 67.100.01

A33

US 224:2000
EAS 165
ISO 8197

UGANDA STANDARD

Milk and milk Products -

Sampling – Inspection by variables

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: agricultural products, dairy products, milk, sampling, inspection by measurements.

ICS 67.100.01

US 223:2000
EAS 161
ISO 5538

UGANDA STANDARD

Milk and milk Products -

Sampling – Inspection by Attributes

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: agricultural products, dairy products, milk, sampling, inspection by attributes.

ICS 67.100.01

US 222:2000
EAS 160
ISO 3356

UGANDA STANDARD

Milk and dried milk, buttermilk and buttermilk powder, whey and whey powder —

Determination of phosphatase activity (Reference method)

First edition:
October 2000

UGANDA NATIONAL BUREAU OF STANDARDS

Price group

Descriptors: dairy products, milk, butter milk, dried milk, serum (whey), chemical analysis, determination of content, enzymatic activity

ICS 67.100.01

US 163:2000

UGANDA STANDARD

Code of Hygienic Practice

for
Milk and Milk Products

First Edition
November 2000

UGANDA NATIONAL BUREAU OF STANDARDS

PRICE GROUP

Descriptors:

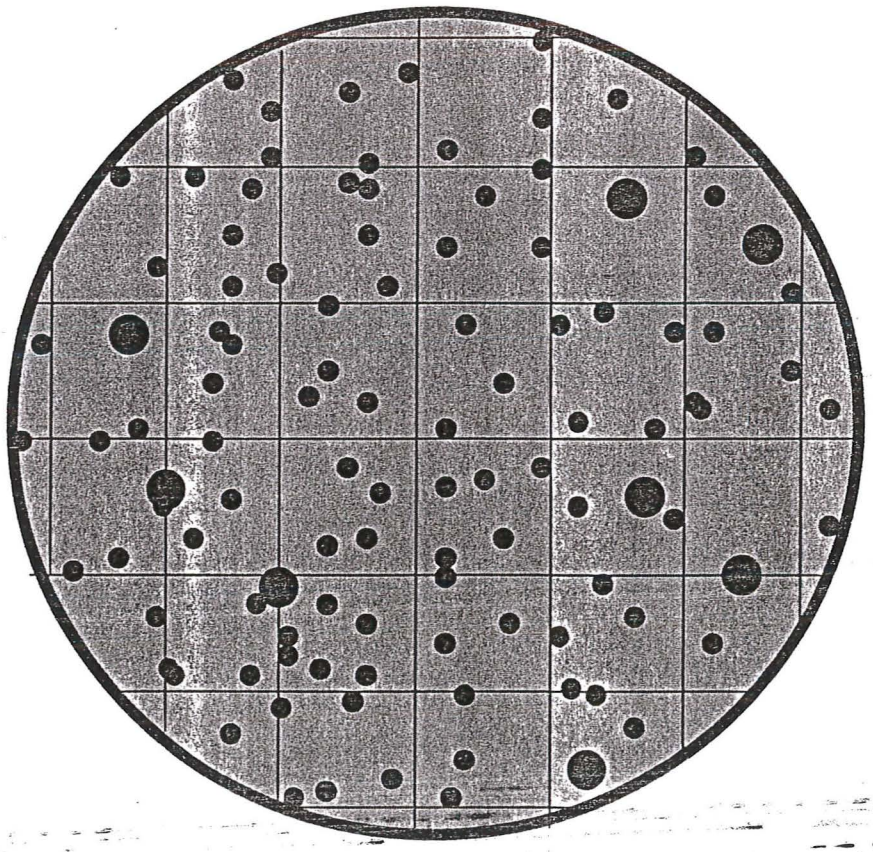
ICS 67.020

Uganda National Bureau of Standards (UNBS)

MANUAL ON

MICROBIOLOGICAL ANALYSIS

Wesuta M. A



1999

ANNEXE 5

Importance de la tuberculose bovine – zoonose en relation avec le SIDA, dans le Sud-Ouest de l'Ouganda
par le Pr. ISHARAZA et al. (MUST)

To Rep-C

ZOONOTIC IMPORTANCE OF BOVINE TUBERCULOSIS AND IN HIV/AIDS EPIDEMIC IN SOUTH WESTERN UGANDA.

W. K. Isharaza, F. Byarugaba, G. Kiwanuka, M. Wesuta
Mbarara University of Science and Technology

1. PREAMBLE

Tuberculosis infection due to *Mycobacterium* spp in both man and cattle is highly prevalent in Mbarara district and neighbouring areas of S. W. Uganda. *Mycobacteria bovis* is known to be a zoonotic disease. The proposed study is to investigate the role (if any) that *M.bovis* may be playing in the tuberculosis infections (with HIV/AIDS epidemic as confounding factor) in S. W. Uganda, a region that heavily relies on livestock and dairy farming.

2. STATEMENT OF THE PROBLEM

There is very high incidence of human tuberculosis in Mbarara University Teaching Hospital and other hospitals/treatment centres in South Western Uganda. During the year 2000 alone, a total of 160 tuberculosis patients were admitted at MUTH. Tentative corollay data also reveals a high incidence of tuberculosis in cattle and other livestock in the same area. During the period of 1997 – 2000, according to meat inspection reports of the total 13288 cattle slaughtered in Mbarara Municipality, 214 i.e. 1.6% were confirmed to be infected with *Tuberculosis bovis*. This does not include cattle in poor health on farms which do not get marketed to urban centers. This scenario has raised concern among scientists, public health workers and veterinarians on the possible health risk due to bovine tuberculosis caused by *Mycobacterium bovis*. Furthermore, given the dominance of the South Western region in livestock farming and dairy industry in Uganda, the existence of tuberculosis in the region would be exarspating the HIV/AIDS epidemic in the country.

Although there is sufficient circumstantial evidence to support the concern over public health risk due to bovine tuberculosis, there is no hard data available to incriminate and determine the zoonotic importance of the disease in Uganda. This project proposal has been developed to address this problem in the short term and investigate further the epidemiological and socio-economic factors leading to control of the disease among the affected communities.

3. OBJECTIVES

3.1. To Establish evidence on the proportion of *Mycobacterium bovis* and other *Mycobacteria spp* other than *M.tuberculosis*, by typing isolates from patients from S. W. Uganda.

3.2. To evaluate the role of zoonotic tuberculosis by typing isolates of *M.bovis* from cattle and livestock products in the study area.

3.3. To validate the tuberculin test currently used in screening cattle for Mycobacteria *bovis* infections.

3.4. To determine the epidemiological factors leading to infections in humans by tracing back and making follow ups on *M.bovis* cases and thereby identify solutions for disease control.

3.5. To conduct epidemiological comparisons with HIV/AIDS patients concurrently infected with *M.bovis*.

3.6. Strengthen research capability of MUST through acquisition of laboratory equipment and training of selected scientists in specialised laboratory techniques.

4. METHODOLOGIES

1. Identification of samples for tuberculosis isolation

1.1. Isolates from in-patients

- Sputum
- Extra – pulmonary biological materials e.g.
  - external or aspirated pleural material
  - aspirates from lymphnodes

1.2. Isolates from post-mortem examinations

(special interest for HIV positive cases concurrently infected with extra pulmonary tuberculosis).

- mesenteric lymph nodes or other biomaterial

1.3. Isolates from abattoirs

(Through routine visits to major abattoirs during meat inspection in the study area)

- Pleural aspirates of tuberculosis confirmed cases
- mesenteric lymph nodes or other biomaterial

1.4. Isolates from farms

Cattle of selected farms will be screened by tuberculin test and some of the positive reactors will be isolated for slaughter and postmortem examination. Specimens will be collected as in 1.3.

2. Screening and typing of tuberculosis isolates

2.1. Microscopy
- Ziehel – Neelisen staining technique
- IFAT (Immunofluorescent Antibody Test).

2.2. Differential cultures
- Lewenstein – Jensen media e.t.c.

2.3. Biochemical tests
- Glucose, maltose, trehalose, glycerol test
- Niacin production
- Sensitivity to thioprene – 2 – carboxylate
- Nitrate reductase
- Agglutination

2.4. PCR (Polymerisation chain reaction) for DNA

Most sensitive and confirmatory test for characterising *Mycobacterium spp.*
Will require collaboration with laboratories outside MUST for training of personnel and characterisation of reference materials.

3. Demographic and other epidemiological field studies
Retrospective and prospective surveys will be conducted for:

3.1. Tracing back of recently discharged patients and those still on treatment by DOT system or current in-patients confirmed as *M. bovis* infected.

3.2. Compiling dermographic information *T. bovis* patients with respect to disease risk factors associated with social-economic and cultural practices and occupational hazards.

3.3. Comparative epidemiological and demographic studies on HIV/AIDS patients confirmed as *M.bovis* infections.

5. RESEARCH PERSONNEL

Project Co-ordinator	-	Prof. W. K. Isharaza (Biochemistry)
Co-investigators:	-	Dr. F. Byarugaba (Microbiology)
	-	Ms. G. Kiwanuka (Biochemistry)
	-	Physician in-charge Tuberculosis ward, MUTH
	-	Dr. N. Tumwesigye (Paediatrics)
	-	Mr. M. Wesuta (Biochemistry)
	-	Sr. in charge (TB ward)
Technologists	-	Mr. J. Mwesigye (Microbiology)
	-	Mr. N. Lwanga (Microbiology)

Collaborating Depts.

- Ms. T. Kyomuhangi (Microbiology)
- National TB/Leprosy Control Centre, Wandegeya.
- CIRAD (France)
- Joint Clinical Research Centre, Kampala.
- Veterinary Department, Mbarara
- Veterinary Medicine, Makerere
- Dairy Development Authority
- Uganda National Bureau of Standards
- Dr. Asiimwe, TB Zonal Co-ordinator, S.W. Uganda.

6. BUDGET

Equipment	
~~UV microscope~~ accessories	2,000,000 ~~5,000,000=~~
ELISA system / Spectrophotometer	10,000,000=
~~Refrigerator/Deep freezer~~	1,500,000
~~Computer (lap top)~~	20,000,000=
	~~12,500,000=~~ 12,000,000=
Laboratory supplies	
Chemical and reagents	1,500,000=
Glassware	1,000,000=
Plastic & disposables	1,200,000=
	3,700,000=
Office	
Stationery	400,000=
Secretarial services	300,000=
	700,000=
Travel	
Motor vehicle (to be availed)	
Fuel 4 x 12 x 30L @ 1,480=	2,131,200=
Services 5% fuel cost	106,560=
Meetings, Workshops	400,000=
	2,637,760=
Personnel	
Patients costs; transport follow ups	500,000=
Safari day allowance	
7 persons x 4 days x 12 months @ 5,000=	1,680,000=
Per diem 4 persons x 20 days @ 48,000=	3,840,000=
	5,620,000=

~~Honararia: (50% basic salary)~~

BUDGET SUMMARY	
Equipment	22,500,000–
Laboratory supplies	3,700,000=
Office	700,000=
Travel	2,637,760=
Personnel	5,620,000=
	35,557,760=

Budget justification.

1. Equipment: Laboratory supplies:
   These are to supplement those already acquired in the milk quality control programme.

2. Office: This item is to cater for data collection and processing.

3. Travel: Transport will be needed for field activities namely patients follow up and detection of tuberculosis in cattle and collection of specimens for laboratory analyses.

4. Other costs: Studies e.g. PCR analyses and differential cultures which are to be carried out outside MUST have not been included in budget estimates.

REFERENCES

Pritchard 1975.	Report on Tuberculosis in Ankole S. W. Uganda
Woodford 1972.	DVM Thesis Zurich. On tuberculosis in buffalos in Queen Elizabeth National Park.
Acen 1991	Msc. Thesis Makerere. Screened cattle in W. Uganda by tuberculosis.
Nyatia 1995.	Msc. Thesis Makerere. Reported prevalence of tuberculosis in cattle.
Ocaido *et al* 1996.	S. A. J. Wild Res. 26(4)
MUST/French Milk Project (2000)	Workshop Report on tuberculosis and brucellosis in Mbarara district.
Isharaza W., Kiwanuka G. and Wesuta M, Byarugaba F.	2001 Retrospective study on tuberculosis in humans and cattle . (in preparation) in Mbarara District: Hospital and Veterinary reports.

ANNEXE 6

ASARECA

Table 1: National Agricultural Research Organisations (NAROs) in ASARECA

1.	Institut des Sciences Agronomiques du Burundi, ISABU (Burundi)
2.	Institut National Pour l'Etude et la Recherche Agronomiques, INERA (DRC)
3.	Department of Research and Human Resource Development, DARHRD (Eritrea)
4.	Ethiopian Agricultural Research Organisation, EARO (Ethiopia)
5.	Kenya Agricultural Research Institute, KARI (Kenya)
6.	Centre National de Recherche Appliquée au Développement Rural, FOFIFA (Madagascar)
7.	Institut des Sciences Agronomiques du Rwanda, ISAR (Rwanda)
8.	Agricultural Research Corporation, ARC (Sudan)
9.	Department of Research and Development, DRD (Tanzania)
10.	National Agricultural Research Organisation, NARO (Uganda)

Table 2: Regional Agricultural Research Networks (RARNs) under ASARECA

First Generation Networks – Operational (established in the 1980s)	
1.	Eastern Africa Rootcrops Research Network, EARRNET
2.	Eastern and Central Africa Bean Research Network, ECABREN
3.	Regional Potato and Sweet Potato Improvement Programme in Eastern and Central Africa, PRAPACE
Second Generation Networks – Operational (established in 1990s)	
4.	Banana Research Network for Eastern and Southern Africa, BARNESA
5.	Postharvest Processing Network, FOODNET
6.	ASARECA Animal Agriculture Research Network, A-AARNET
7.	Eastern and Central Africa Maize and Wheat Research Network, ECAMAW? ?
Projects, Programmes and Initiatives – Operational (established in the 1990s)	
8.	African Highlands Initiative, AHI
9.	ASARECA Technology Transfer Project
10.	Eastern and Central Africa Programme for Agricultural Policy Analysis, ECAPAPA
11.	Electronic Communication, AFRICALINK
New Networks under Planning (to be established in 2000)	
12.	Eastern, Central and Southern Africa Rice Research Network, ECSARRN
13.	Eastern Africa Plant Genetic Resources Network, EAPGREN
14.	Eastern and Central Africa Regional Sorghum and Millet Research Network, ECARSAM
15.	Soil and Water Conservation Network, SWMNet
16.	Coffee Research Network, CORNET
17.	Regional Agricultural Information Network, RAIN
18.	Strengthening the Capacity of NARS for Managing Regional Programmes
19.	Trees on Farm Network - TOFNET

ANNEXE 7

Présentation de la SUMPCA

THE REPUBLIC OF UGANDA

THE CO-OPERATIVE SOCIETIES STATUTE, 1991

Certificate of Registration

OF

SOUTH WESTERN UGANDA MILK PRODUCERS COOPERATIVE SOCIETY LIMITED - P.O. BOX 1329, MBARARA.

I hereby certify that I have this day registered the above-named Society and its by-laws under the provisions of section 5(2) of the Co-operative Societies Statute, 1991

Given under my hand this FOURTHEENTH day of AUGUST ~~nineteen hundred and~~ TWO THOUSAND AND ONE.

Certificate No. 6440

FREDERICK EDWARD MWESIGYE.

Registrar of Co-operative Societies

SUMPCA EYOREKYEREIRE KUKORA KI?

SUMPCA eyorekyereire kukora ebi ahaifo:

- Kugumizamu kushagika okucondooza ebyagambwa aharuguru
- Okubuzya n'okujanjaaza amakuru omuri ba memba baayo ahabwemirimo eyerikukora.
- Kutebekanisa omushomo omukwezi kwamwenda 2001 ahu ebyarugire omukucondooza biryorekyerwa abariisa.
- SUMPCA eyorekyereire kutaho emishomo endijo ekwatiraine n'ebiragiro ebikwatiraine n'obutare, ebigombe, emitwarize y'obuhingi hamwe n'embaririra, emitwarize y'obuhingi n'oburiisa erikuhweerwa ebitongore bya gavumenti (PMA, ACU, NBS, NARO) hamwe n'ebindi.

(e) Okuriisa Embuzi z'amate

Abakugu ahabw'embuzi z'amate (The Dairy Goat Project - Alliance Pastrole) nibaija kuhika omu Uganda ebiro 19th August 2001. SUMPCA eyorekyereire kubakiira kandi ekagira ekiyabegamu.

ENDAGIRIRO
SUMPCA
P.O. BOX 1829,
MBARARA.

Okutaaha omukibiina (SUMPCA)
Okutahibwa omukibiina ni Shs. 10,000/=
Okuba memba ni Shs. 50,000/=

Okwenda kumanya ebirikukiraho buuza:
Mr. Reonard Mugarura (omushuganisa)
P.O. Box 1829,Mbarara.
Tel. 075 649506

Rev. Charles Bwirizayo
P.O Box 320, Mbarara
Tel. 077 617183

Ch Bwirizayo.

SOUTH WESTERN MILK PRODUCERS CO-OPERATIVE ASSOCIATION

ENTURIKIRIRO

Ahari abariisa mweena,

Ekibiina eki kikatandika na ba memba 24 mbwenu hati kyahitsya 139. E. gyendererwa kyaakyo okwimutsya n'okutunguura abariisa boona omu kicweka kya burengyerwa izooba bwa Uganda kuhika ahakuriisa kw'omutindo. Abariisa mweena nimushabwa kwegaita ahari abo abagambwaho aharuguru kutungura ekibiina eki.

Ninye Rev. Charles Bwirizayo Ch Bwirizayo.
President/C/Man - South Western Uganda Milk Producers Co-operative Association (SUMPCA)

ABEBEMBEZI B'EKIBIINA

Charles Bwirizayo.

Mukuru w'entebe: Rev. Charles Bwirizayo,
Nyabushozi - 077 - 617183

Omuhwezi w'entebe: Mr. Moses Mwebaze, Kashari 077 - 603725

Omuhandiiki: Mr. Pascal Murangira, Kabale 075 - 616343

Omubiiki: Mr. Jimmy Kadogo, Ibanda - 075 - 616343

SUMPCA N'ENKI?

South Western Uganda Milk Producers Co-operative Association n'ekibiina kya abariisa aberundaine, ekyatandikire n'omwaaka 2001 - obwo barikurundanwa ekibiina ky'aba Faransa ahabw'amate (Mbarara Milk Project). SUMPCA eruho ahabwokunywanisa abariisa, n'ebitongore bya gavumenti hamwe n'eby'abantu buntu UNBS, MAAIF, DDA n'ebindi. Ba memba ba SUMPCA nibeija kubanza kutunga okwegyesibwa okwomutindo obwo bakwatanise n'ekitongo. kya Bufaransa ekyobumwe omu Uganda.

SUMPCA EKOZIREKI?

N'obuhwezi obuhairwe ekitongore kyobumwe kuruga bufaransa ebi ahaifo nibyo SUMPCA ebasize kukora:-

(a) Okwerundaana kw'abariisa

SUMPCA eyigwireho ofiisi yaabo aha kibanja namba 3 aharuguto rwa Lower Circular omuri Mbarara (ahaifo ya Boma Primary School). Nihaija kubaho emishomo n'enkiiko ahamwanya ogu ahabwa abebembezi bekibiina ekirareteho enkora nungi n'obumwe ahagati y'abebembezi b'ekibiina hamwe n'abariisa.

(b) Okubuzya amakuru

SUMPCA nemanyisa abariisa mweena ahabw'okucondooza endwara z'orukororo (T.B) n'obutorogye (Brucellosis). SUMPCA negumizamu emanyisa abariisa ebirugire omukucondooza oku hamwe n'agandi makuru agakwatiraine n'omutindo gw'oburiisa.

(c) Okucondooza orukororo n'obutoroogye

Okucondooza oku kukatandika omukwezi kwakana 2001 na tiimu y'abashaho b'ente bebembeirwe Dr. Vicent Castel kuruga omuri CIRAD Bufaransa. Abariisa mwena abahikirweho omumashaza gaanyu nitubasiima ahabw'entebekanisa nungi eyimwaborekire. Ekigyendererwa kyokucondooza oku n'okumanya obwingi bwendrwara ezagambwaho omumasyo g'ekicweka eki ekya bure..gyerwa izooba. SUMPCA ekwatanise n'ekitongore ky'eby'enyamishwa omu district egi eyineho entekateka y'okurwanisa, okwerinda hamwe n'okugyema endwaara ezagambwaho.

Aha muheru gw'ebi byoona obuyonjo n'omutindo gw'oburiisa nigwija kuteebwa omunkora.

(d) Okucondooza ahaby'akatare k'amate

Omukwezi kwakataano 2001, SUMPCA eobwo erikuhwerwa omukugu omu byobutare kuruga CIRAD (France) M/S Benedicte Pastel ekatandikaho okucondooza kw'engyenda y'amate hamwe n'ebirukugarugamu omukicweka kya Mbarara kuza omu bibuga ebi .nka Masaka, Kampala ahabw'okwenda kutungura n'okuhamya akatare aka aharurengo orwahansi. Okucondooza oku nikwija kuba nikutandikira ahu amate gari kukomooka garikuza ahabyooma byaago omuri Mbarara, omwetorooro gwaago omubutare obutongore hamwe n'obutari butongore hamwe na muheru yaago omubyaaro. Omukucondooza oku SUMPCA eyabamanyisa abariisa omukwerundana okureije kubaho omubiro byajuba.

(1)

Southwestern Uganda Milk Producers
Co-operative Association (SUMPCA
Tel. 0776171183
P.O. Box 1829
Mbarara

13/10/2001

The Greeb of honour
Mr. TULASNE &
LE BOAS
CIRAD-EMVT
FRANCE

Attn. to:-

RE: A PROGRESSIVE REPORT ON THE MBARARA MILK PROJECT

INTRODUCTION:-

The French Government through its Foreign Affairs Ministry and represented by the Head of the Co-operation and Development M/s Michele-Baheite at its Embassy in Uganda established a Co-operation with Ugandan Government represented by the Ministry of Agriculture, Animal Industry and Fisheries (M.A.A.I.F) to develop the Dairy Industry in Uganda with special Emphasis to the Pastoral area of Mbarara.

HISTORICAL BACKGROUND:-

The Project started in 1998 with 24 farmers from the Counties of Kashari, Nyabushozi, Isanda and Rubanda in Kabale District due to the highly developed dairy performance in the region.

A French Agronomist and other two French veterinary researchers came and made a research study on the Milk production,

— Collection of Information on the;
(i) Calves growth rate
(ii) Milk production recording/
(iii) Animal Disease
(iv) Benefits and expenses.

Pasture sampling

→ P.2.

The Project staff kept on giving advice to the farmers (the 24) on their farms particularly the health of their Animals, improve on their milk production, keeping of farm records and improve on their pastures. These farmers had several meetings with the Project staff and exchanged a number of ideas especially on how to overcome the problems facing them as farmers.

Through these interactions and meetings, the farmers developed a common desire to come together in an association collectively analysing their problems, find their root causes, their effects on their business as farmers and find solutions to them.

They examined various forms of business organisations and opted to form a Co-operative Association namely "SUMPCA". The main objective of the Association was to pool their resources and marshal bagaining power to be able to effectively play a role in the pricing of their products especially Milk. They are also targeting access of extension services that will be available under the National Agricultural Advisory Programme (NAADS) and the plan for the Modernisation of Agriculture (PMA).

In November 2000, three farmer's representatives Sponsored by the French Embassy through CIRAD went to France and came back with the idea of making a farmer's federation among st the project farmers and even spread the gospel to other farmers who in response showed interest to join them, thus a total of 139 members at present.

29th — 30th Nov. 2000 - Workshop:-

Farmers held a workshop at Rwizi Arch Hotel - Mbarara,

→ (3)

On the dissemination workshop, these below were the main objectives:-

(a) To inform the farmers/beneficiaries that the research phase is complete,
(b) That the 2nd phase will be implemented in the year 2001,
(c) That the research results will be presented,
(d) To Exchange views and experiences on Milk production project and to commend this programme as an original experience longing for Milk production development in Mbarara.

THE 2nd PHASE OF THE PROJECT:-

A meeting was held at Rwizi Arch Hotel on 3rd April 2001 and here below were the deliberations;

(i) The Project was given a name — SumPCA,
(ii) The Associations executive was elected;
(iii) Mr. Baseeta was assigned the duty of preparing the "Registration Certificate" and the "memorandum of Association",

Another meeting was held at the French Embassy on 6th April 2001 between the Head of the Co-operation, Co-operation attache and the Sumpca executive;

Here below are the matters discussed:-

(a) Registration of the Association,
(b) An agreement to be made with the Head of the Co-operation
(c) A Comprehensive budget/work plan be prepared,
(d) An Account be opened and the project money be transferred to it.

The project therefore becomes operational.

WHAT ARE THE DEVELOPMENTS NOW?:-

(i) The Registration Certificate was prepared - Baseeta is bringing it one of these days.

→ (4)

(ii) An agreement with the Head of the Co-operation was made and our copy is already in my file.
(iii) A Comprehensive budget/work plan was prepared.
(iv) An Account was opened in the Standard Chartered Bank and the project money was transferred to it.

Membership:-

The Association has a membership of 59 and the members is expected to rise in the near future (even today).

Books of Accounts:-

The Association has managed to get some necessary books of Accounts required by the Co-operative Association.

SHARE CAPITAL:-

The normal share is 50.000/= (membership fee),
Entrance fee is 10.000/=
Tot. = 60,000=

A SHORT BRIEF ON THE DISTRICT OF MBARARA MILK PROJECT (TUBERCULOSIS AND BRUCELLOSIS EPIDEMIOLOGICAL SURVEY UNDER THE ARRANGEMENT OF SUMPCA:-

The Project Could not tuckle the issue of the milk Quality unless the Health of our Animals is first checked. The Epedimiological Survey therefore started in the whole District on 2nd May 2001, expecting to end on Wedn. 29th Aug. 2001. The Vet. team is expected to have Covered about 43,600 H/Cows — about 393 Kraals/herds.

METHODS USED:-

1- The farmers visited were selected ah random in the Counties of Kashari, Rwampala, Nyabushozi, Kazo, Ibanda, Isingiro and Bukanga.
2- The Vet. team locates the randomly selected farmers and give them appointment.
3- Test the Animal against Tuberculosis, Sample the Animal against Brucellosis
4- Tag the Animal.

5- Finally the herd is checked 3 days later to get the Tuberculosis results and for the feedback (Results are given, One Questionaire is filled, and a booklet is given).

FIELD RESULTS BY 22ND MAY 2001:-

(a) 51 farmers have been contacted, 44 Kraals/herds have been tested (others were to be tested the following days)
(b) The two veterinary teams worked on more than 1000 Cows

RESULTS:-

For Tuberculosis; 11% of the cows tested were positive,
10% Doubtful,
80% of the herds tested are positive (at least one positive case in the whole herd).

For Brucellosis;
9% of the Animal tested are positive.

I am Sincerely thankful to M/S Michele-Baherle, CIRAD and the Government of France at large for Sending us a young, Devoted, Energitic, hardworking Doctor by the names of Vicent Castel. I cannot forget our Doctors who worked tirelessly with him. These include;

1. Dr. James Dhalwa
2. Dr. Ephraim Rubabinda
3. Dr. Hilda Ruheesi
4. Rusiita J.B. Dr.
5. Dr. Atuhaire Andrew

They Successfully did this recommandable work with the para vets (AHO's).

Soon after the arrival of Dr. Vicent, came another agronomist by the names of Ms. Benedict Pastel - She is currently Studying the Marketing of our milk. I further thank the French Govt for the Continuous Support. Benedict will be with us until Sept. 2001.

→ (6)

(6)

THE DAIRY GOAT TEAM:-

Two Experts from France Concerning a dairy goat project have been in Mbarara Since 19th Aug. 2001. A Good number of farmers held a workshop with them on 25th Aug. 2001 - Yesterday at Rwizi Arch Hotel.

The Dairy goat project was highly welcomed.

Conclusion:-

It is my prayer that the French Co-operation Continues to Support and even expand this project to Some other Districts in the Country So that Ugandan farmers Can be encouraged to produce a high Milk yielding Cows. We hope this is the beginning of a long term development plan between us as farmers and the Government of France.

I am particularly thankful to M/s Michele-Baherle, H.E. The Ambassador for the encouragement, arrangement and Support in this Cause.

Alluta Continua,

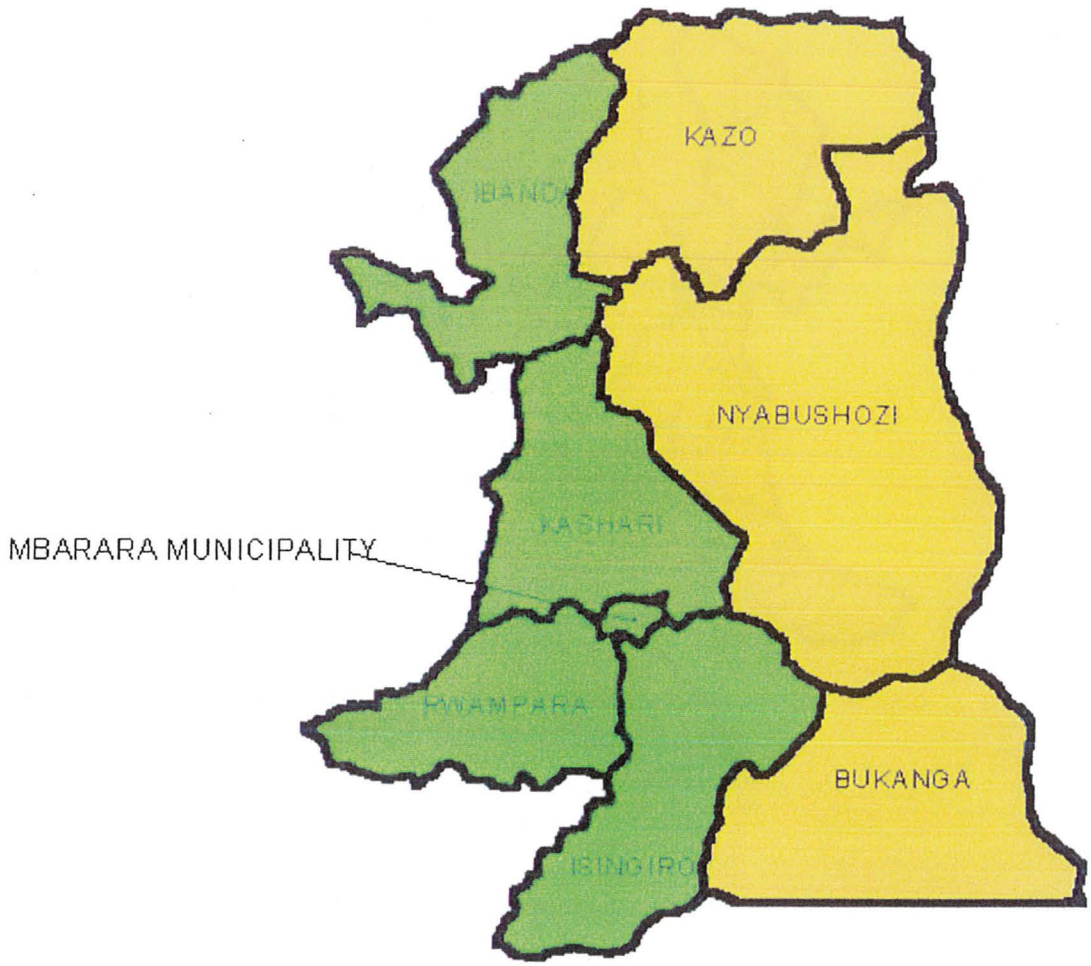
Revd. Charles Kiriizagyo

President/Chman — Sumpca.

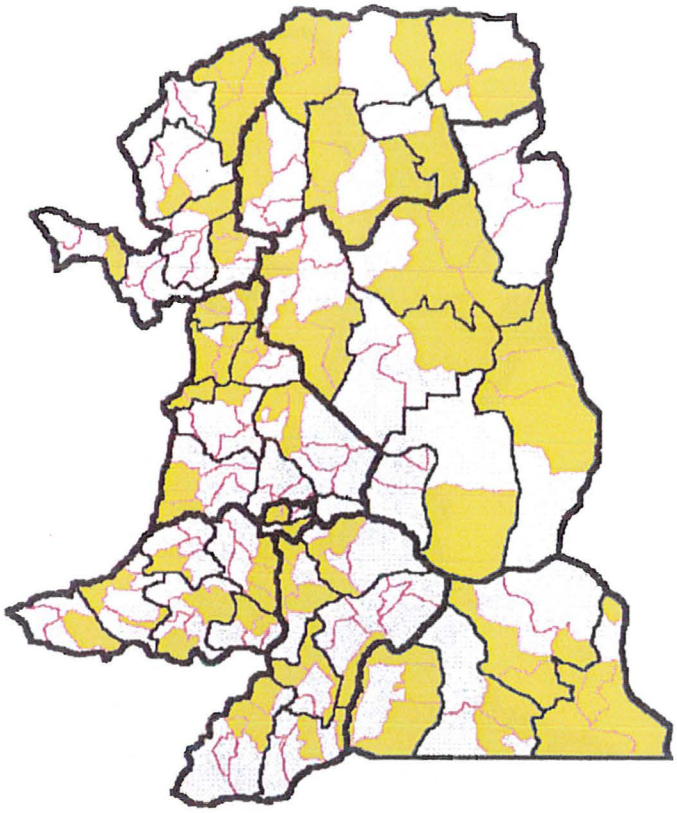
ANNEXE 8

Enquêtes tuberculose et brucellose bovines : transparents
(réunion SUMPCA – M'Barara)

CARTE SIG DEFINITION DE LASTRATE PASTORALE (EN JAUNE ET DE LA STRATE AGROPASTORALE (EN VERT)



CARTE S.I.G. : Paroisses sélectionnées au sein du district de Mbarara



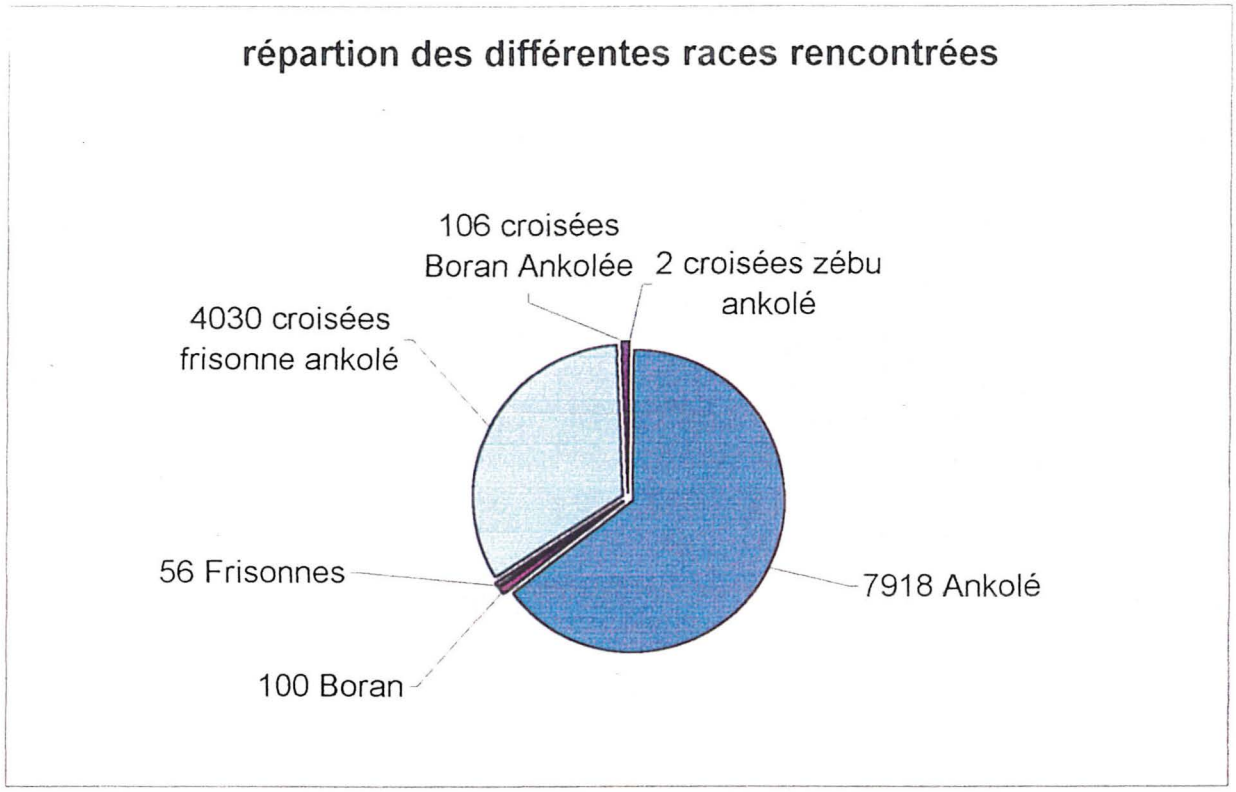
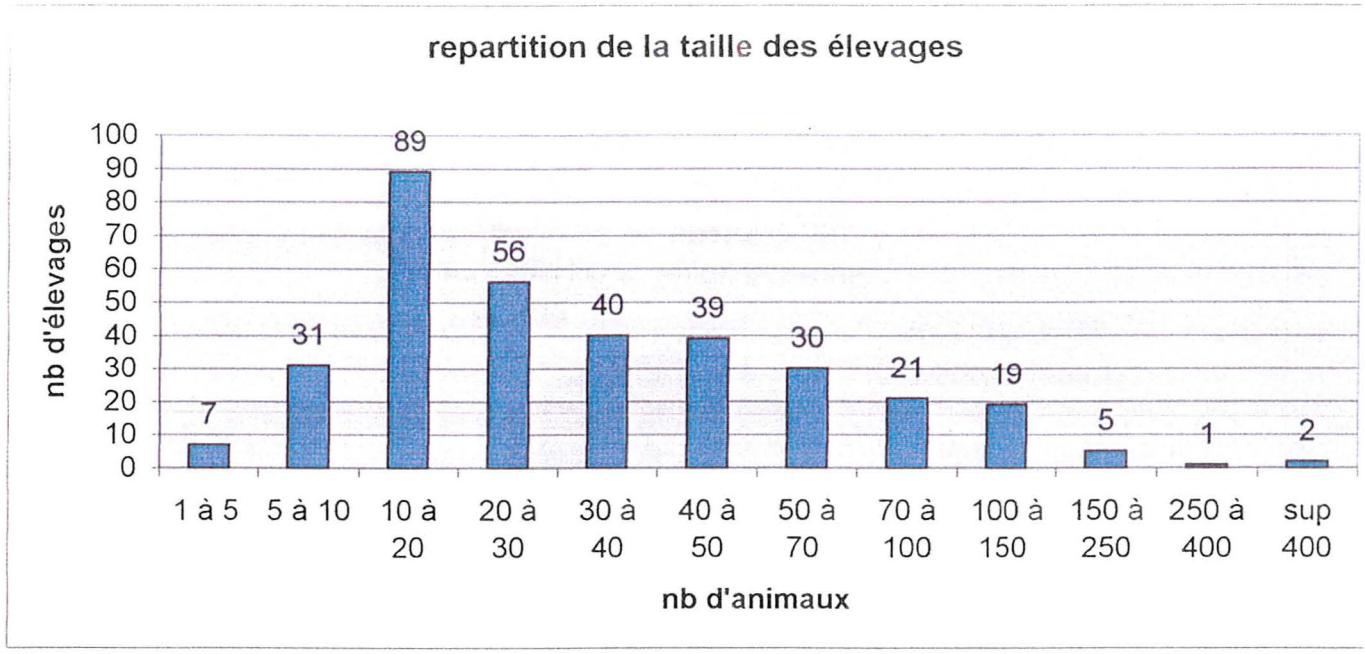

répartion des différentes races rencontrées
106 croisées Boran Ankolée
2 croisées zébu ankolé
4030 croisées frisonne ankolé
56 Frisonnes
100 Boran
7918 Ankolé

FIG25


repartition de la taille des élevages
nb d'élevages
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80
70
60
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7
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56
40
39
30
21
19
5
1
2
1 à 5
5 à 10
10 à 20
20 à 30
30 à 40
40 à 50
50 à 70
70 à 100
100 à 150
150 à 250
250 à 400
sup 400
nb d'animaux

FIG N°23

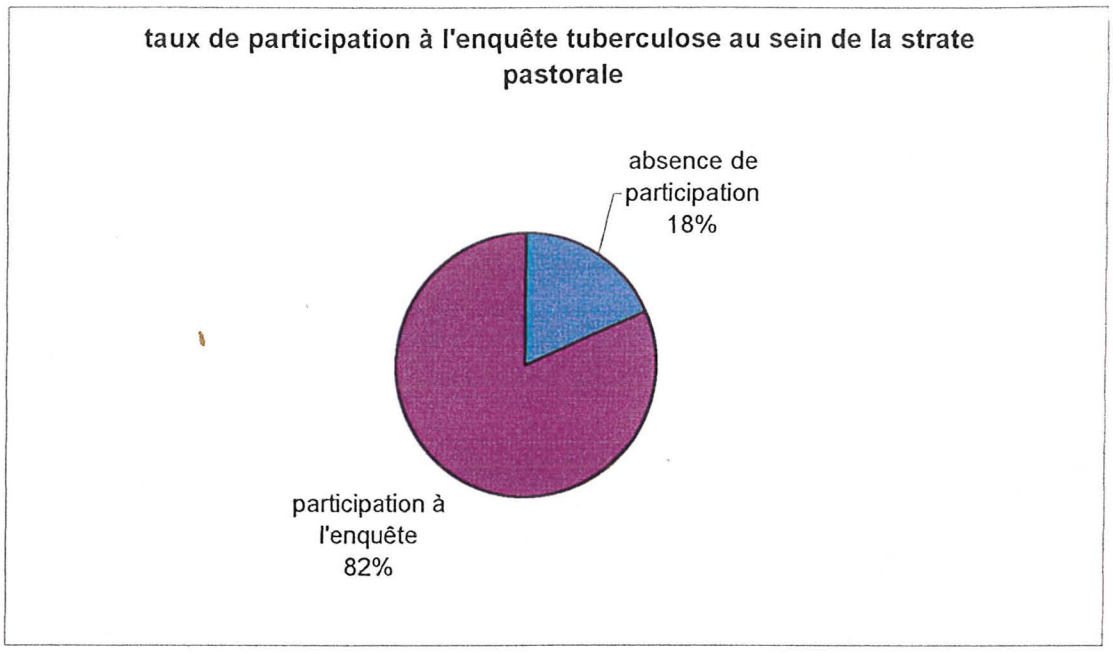

taux de participation à l'enquête tuberculose au sein de la strate pastorale
absence de participation 18%
participation à l'enquête 82%

FIG :17

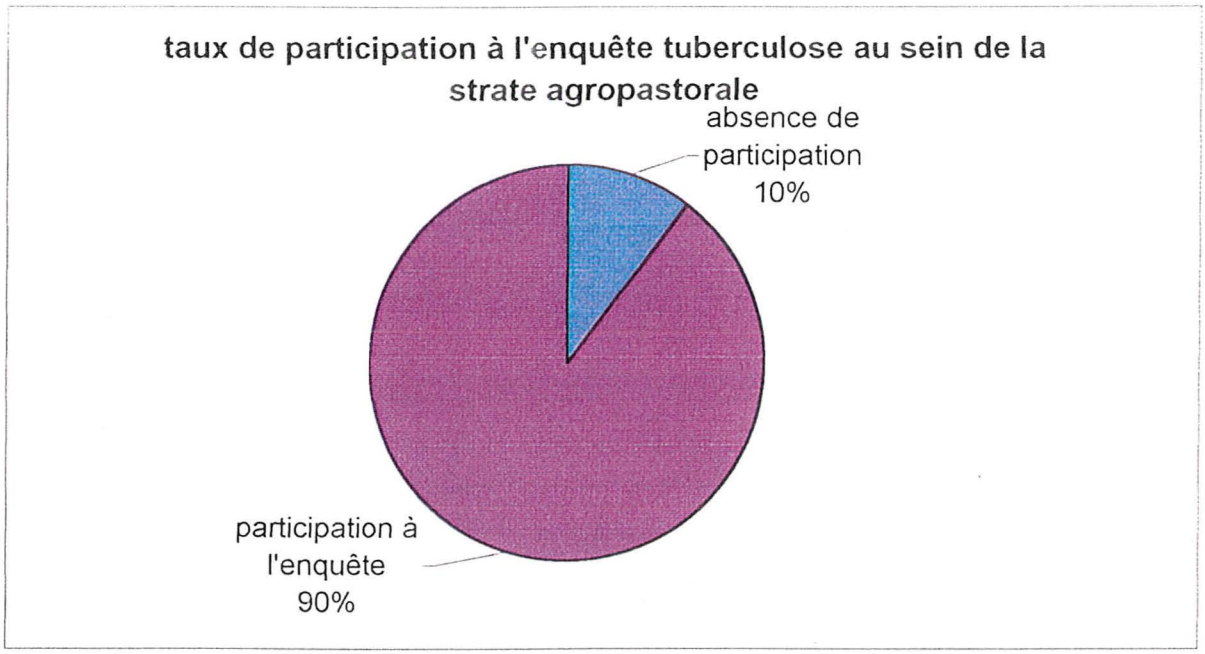

taux de participation à l'enquête tuberculose au sein de la strate agropastorale
absence de participation 10%
participation à l'enquête 90%

FIG :18

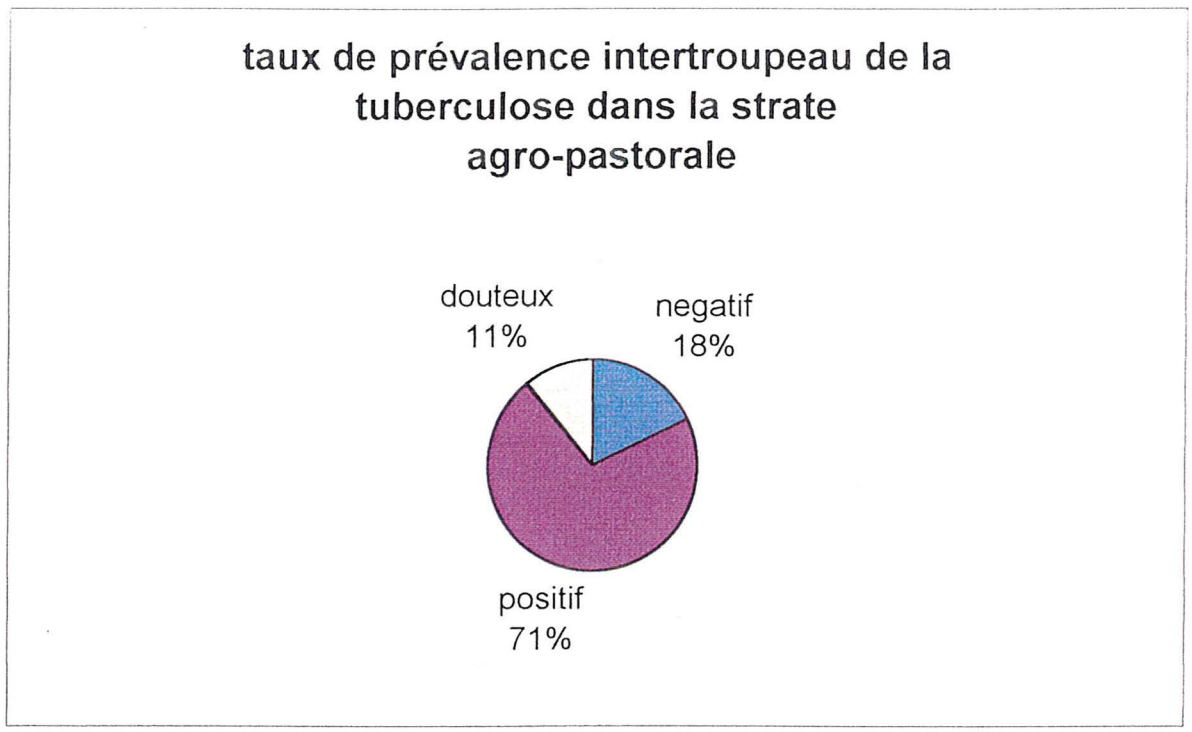

taux de prévalence intertroupeau de la tuberculose dans la strate agro-pastorale
douteux 11%
negatif 18%
positif 71%

FIG 30

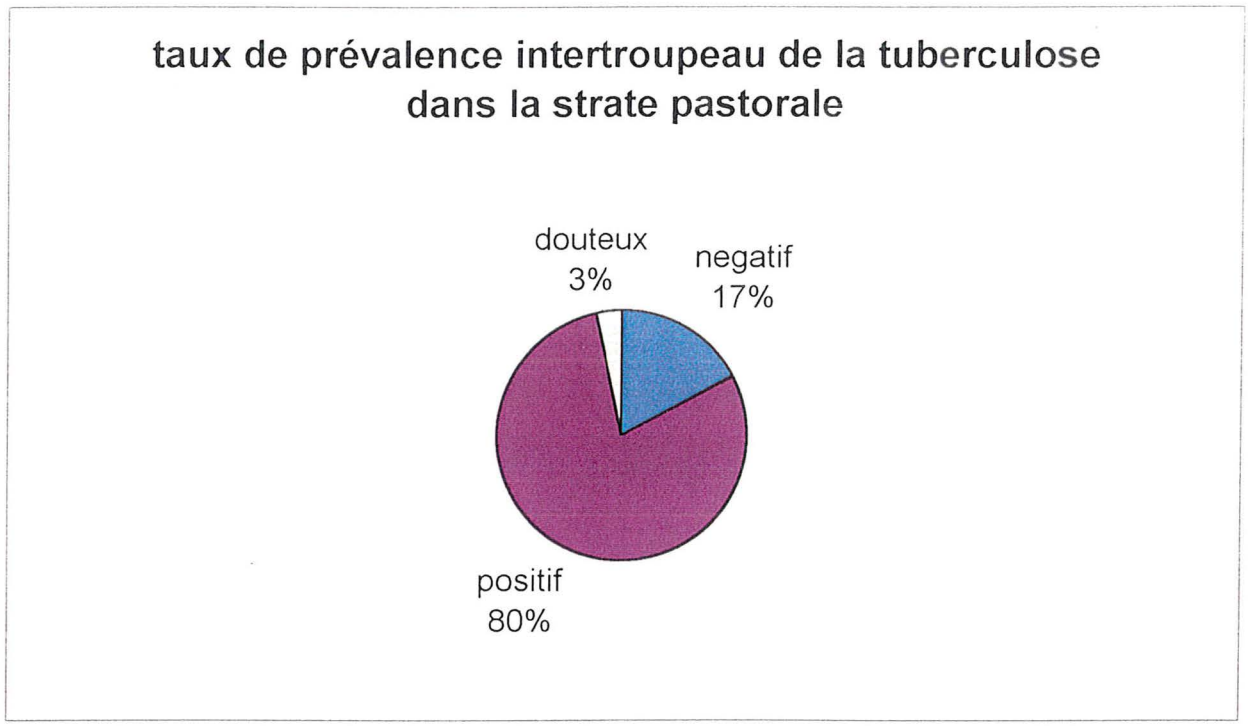

taux de prévalence intertroupeau de la tuberculose dans la strate pastorale
douteux 3%
negatif 17%
positif 80%

FIG 29

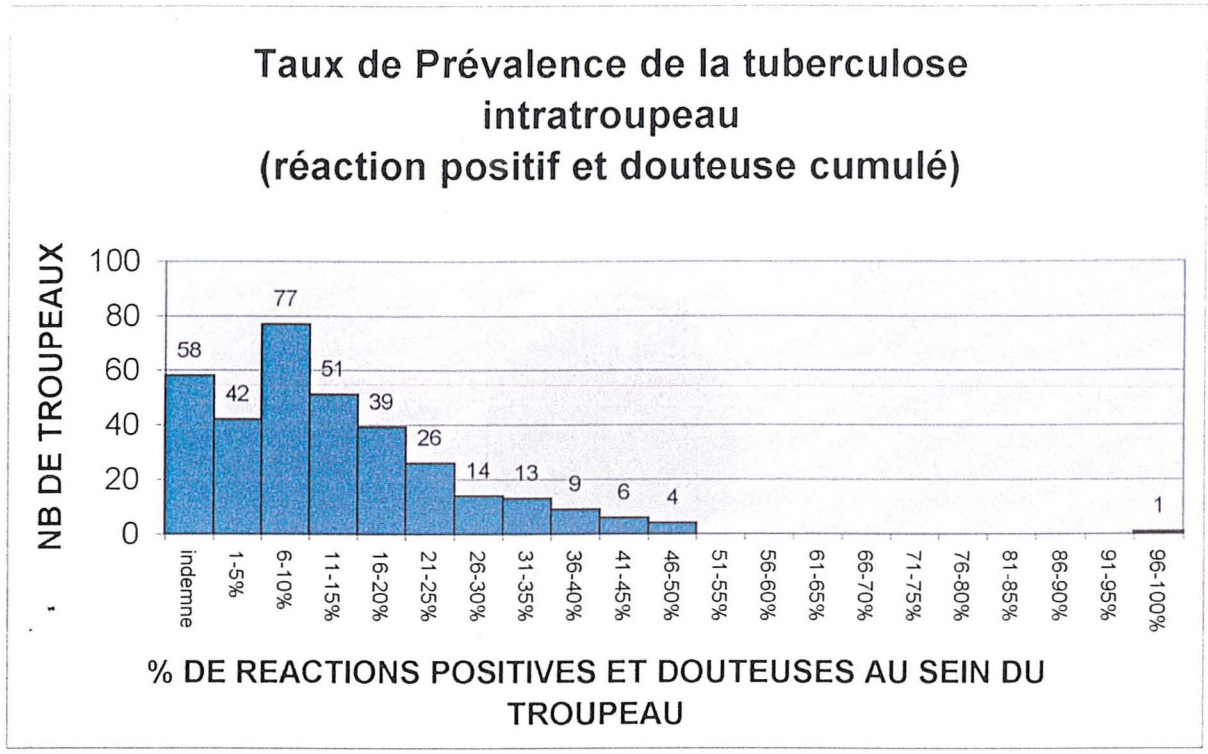

Taux de Prévalence de la tuberculose intratroupeau (réaction positif et douteuse cumulé)
NB DE TROUPEAUX
100
80
60
40
20
0
58
42
77
51
39
26
14
13
9
6
4
1
indemne
1-5%
6-10%
11-15%
16-20%
21-25%
26-30%
31-35%
36-40%
41-45%
46-50%
51-55%
56-60%
61-65%
66-70%
71-75%
76-80%
81-85%
86-90%
91-95%
96-100%
% DE REACTIONS POSITIVES ET DOUTEUSES AU SEIN DU TROUPEAU

FIG 34 bis

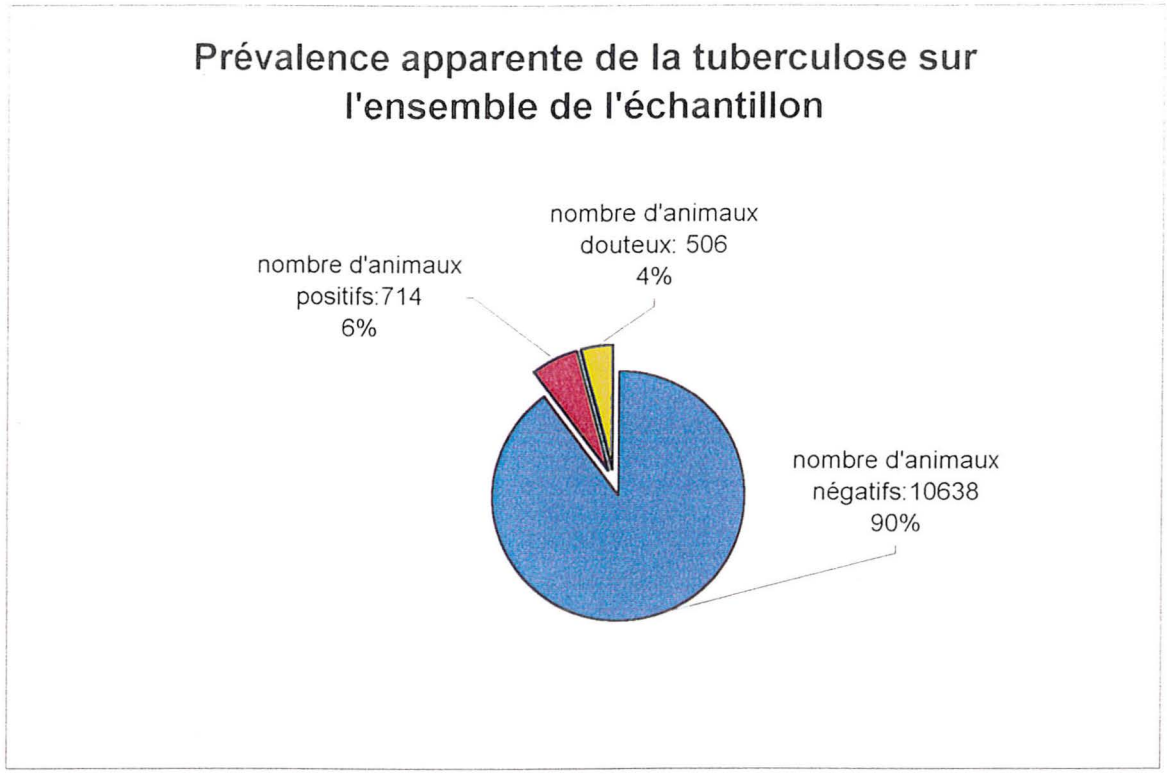

Prévalence apparente de la tuberculose sur l'ensemble de l'échantillon
nombre d'animaux douteux: 506 4%
nombre d'animaux positifs:714 6%
nombre d'animaux négatifs:10638 90%

FIG 31

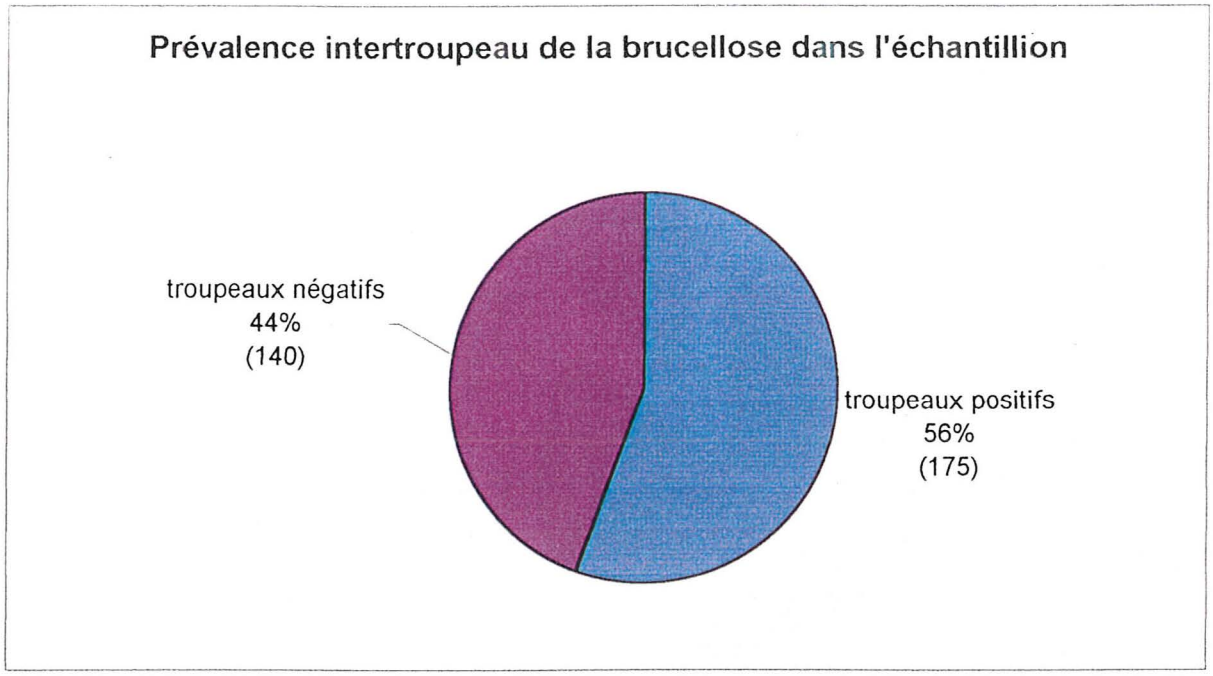

Prévalence intertroupeau de la brucellose dans l'échantillion
troupeaux négatifs
44%
(140)
troupeaux positifs
56%
(175)

FIG 37

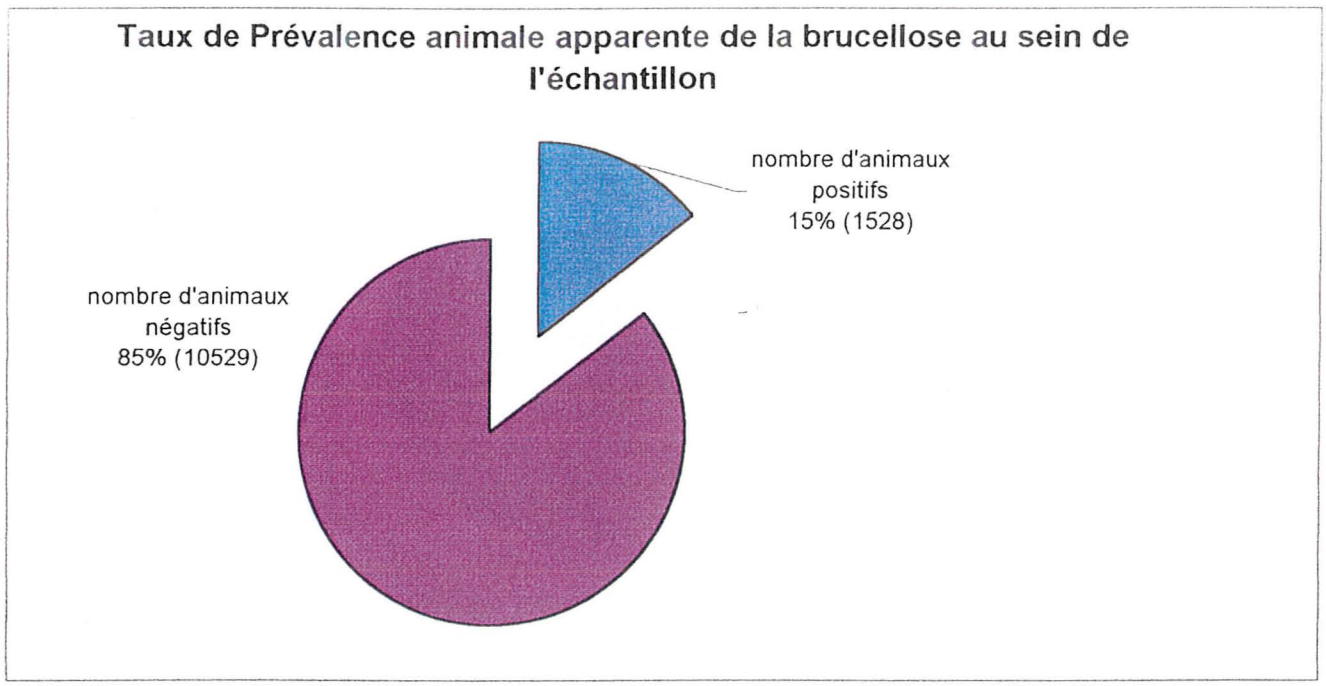
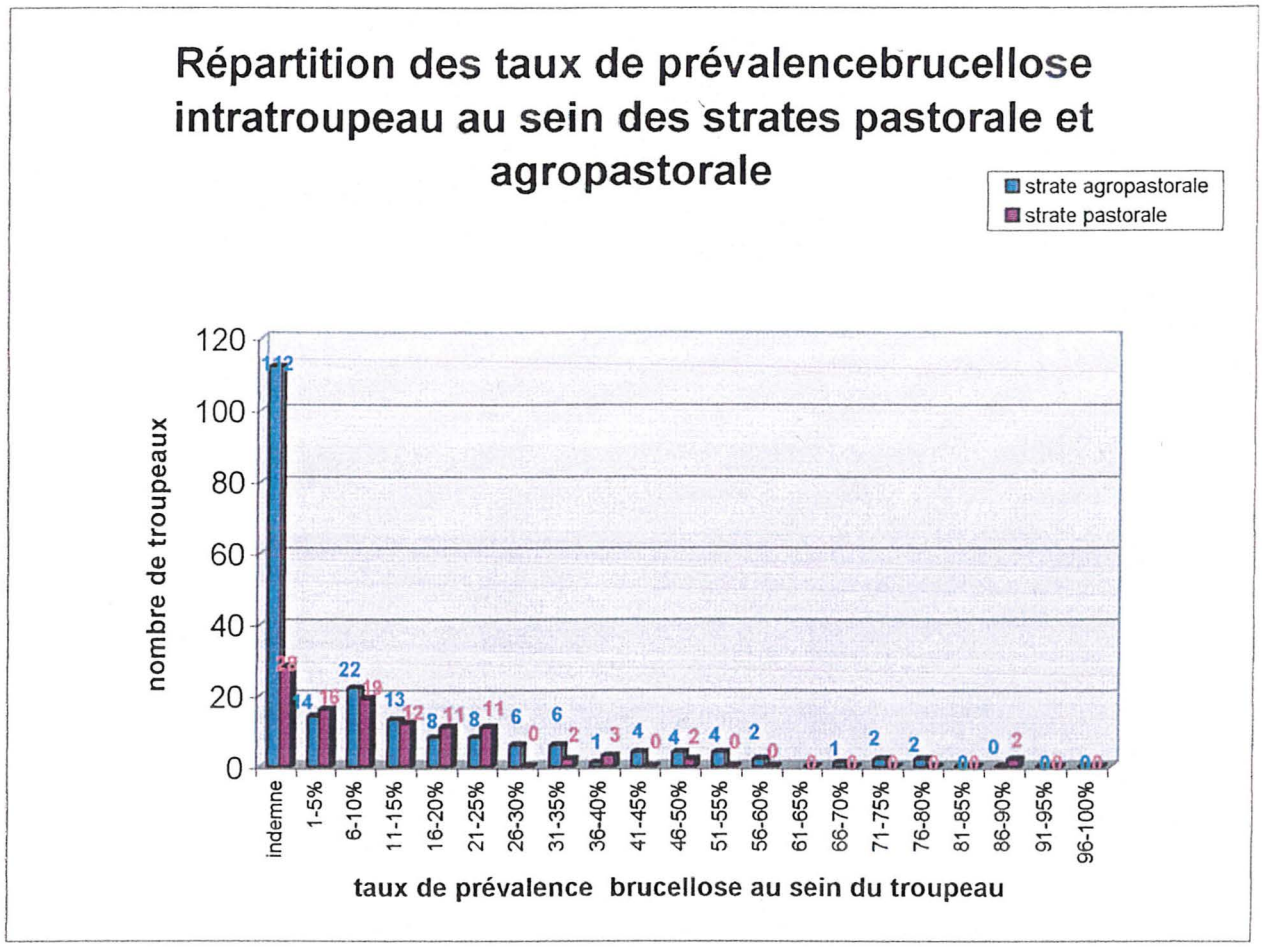

Taux de Prévalence animale apparente de la brucellose au sein de l'échantillon
nombre d'animaux positifs 15% (1528)
nombre d'animaux négatifs 85% (10529)

FIG 40

FIG 43


Répartition des taux de prévalencebrucellose intratroupeau au sein des strates pastorale et agropastorale
strate agropastorale
strate pastorale
nombre de troupeaux
120
100
80
60
40
20
0
112
28
14
16
22
19
13
12
8
11
8
11
6
0
6
2
1
3
4
0
4
2
4
0
2
0
0
0
1
0
2
0
2
0
0
0
0
0
2
0
0
0
0
indemne
1-5%
6-10%
11-15%
16-20%
21-25%
26-30%
31-35%
36-40%
41-45%
46-50%
51-55%
56-60%
61-65%
66-70%
71-75%
76-80%
81-85%
86-90%
91-95%
96-100%
taux de prévalence brucellose au sein du troupeau

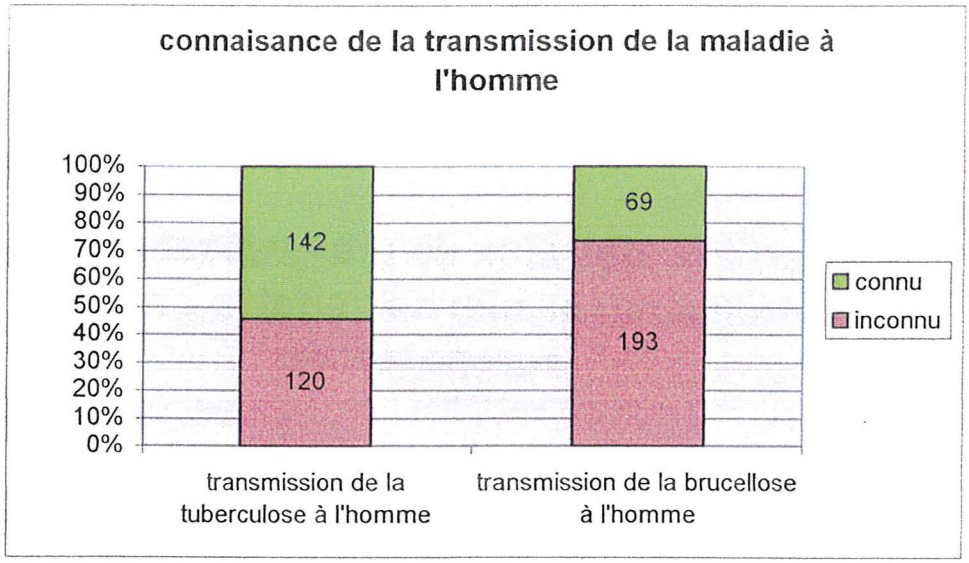

connaisance de la transmission de la maladie à l'homme
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
142
120
69
193
connu
inconnu
transmission de la tuberculose à l'homme
transmission de la brucellose à l'homme

FIG 51p

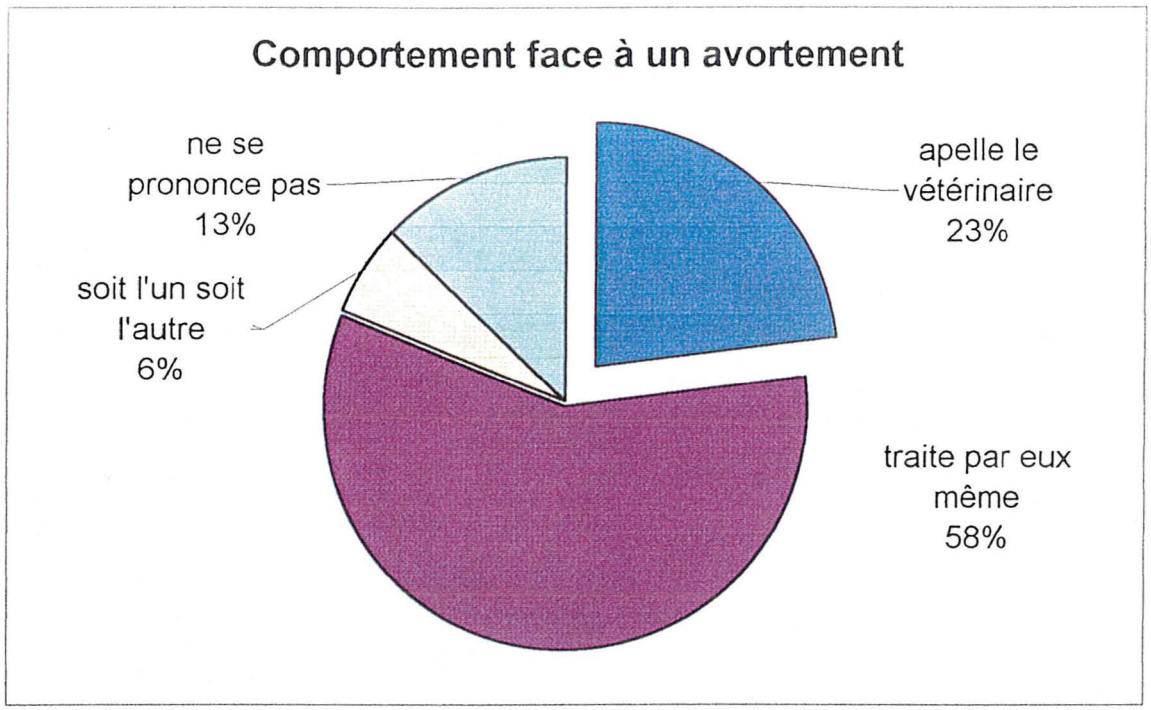
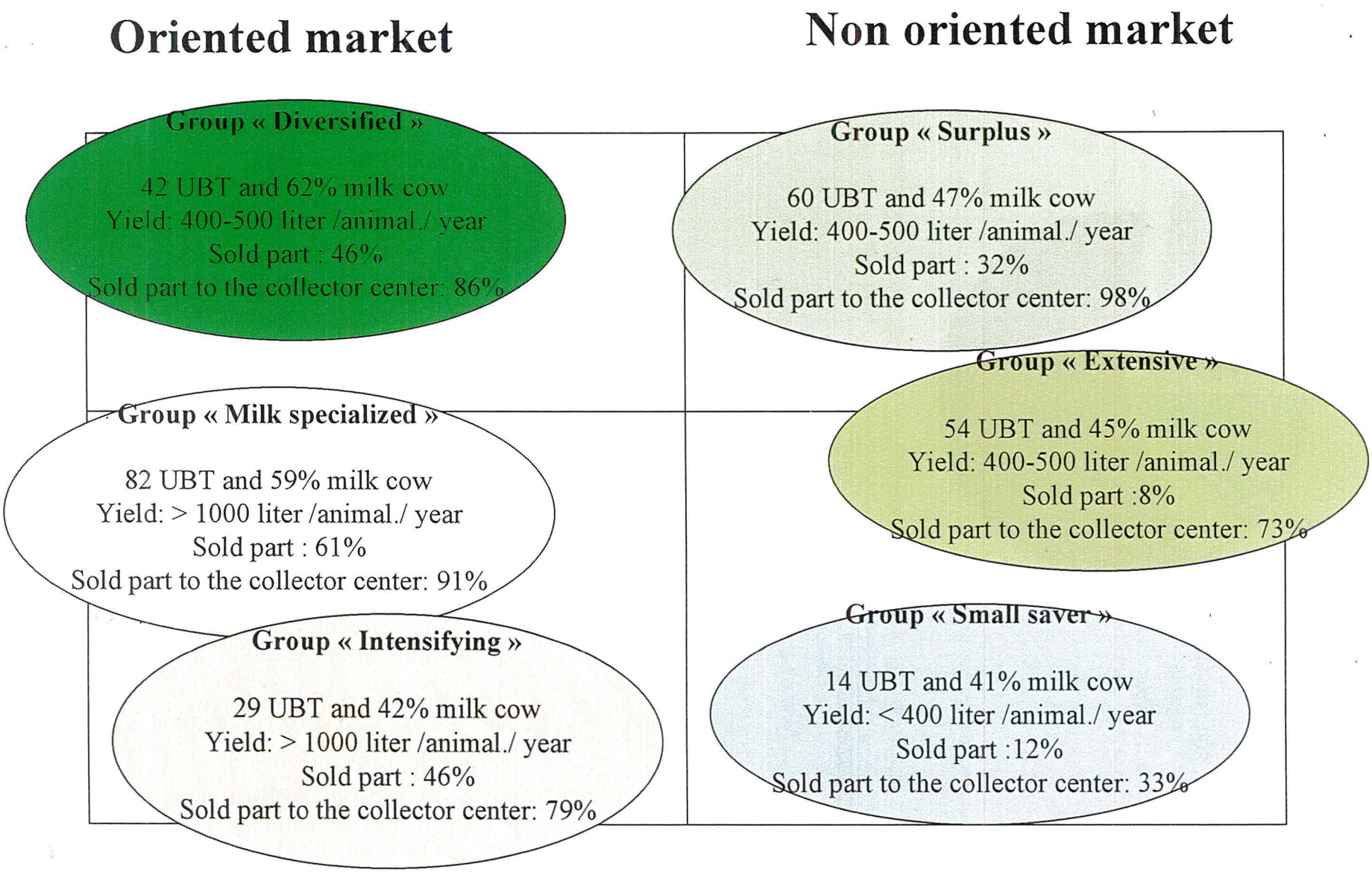
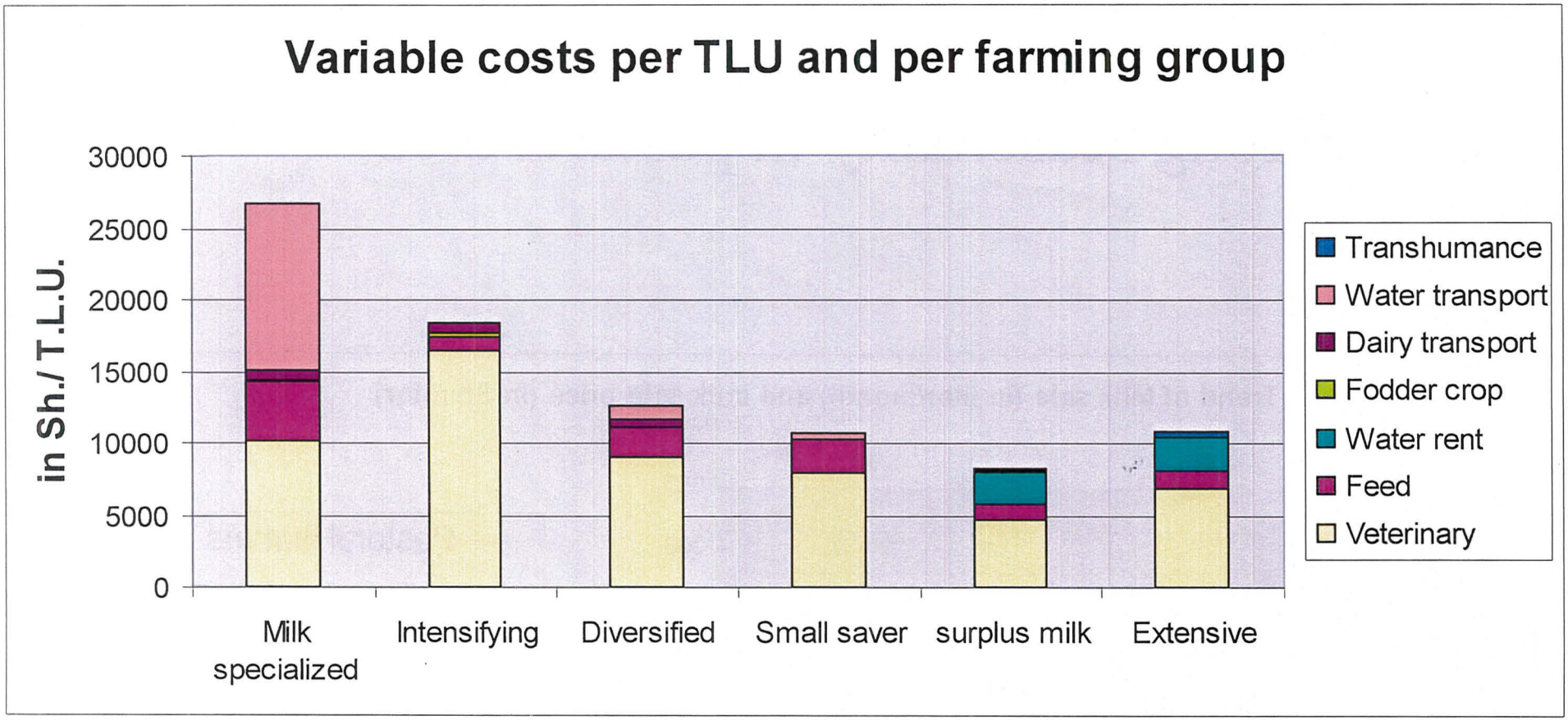

Comportement face à un avortement
ne se prononce pas 13%
soit l'un soit l'autre 6%
apelle le vétérinaire 23%
traite par eux même 58%

FIG 57-58

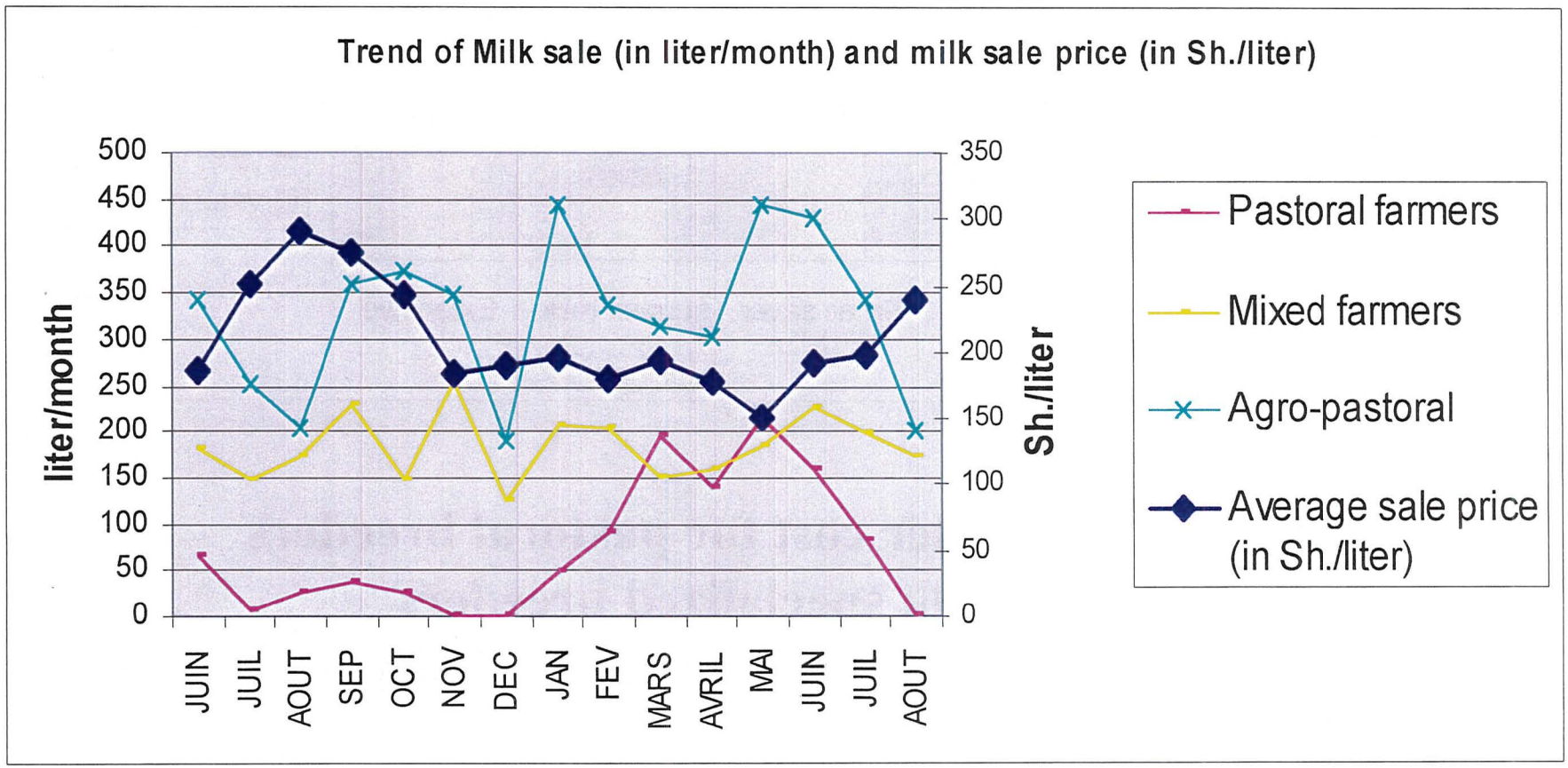
Socio-economic determinants of the milk production





Importance of water cost for pastoral breeders
but also milk specialized breeders
Veterinary cost for intensifying system

Strong seasonality in pastoral area



ANNEXE 9

Présentation de « LAITROP »
(CIRAD-EMVT)

le lait, une production en plein essor dans les pays du Sud

Laitrop
la filière du lait au Cirad

Traite traditionnelle des bovins, Tchad

Traite traditionnelle des chèvres, Brésil

Dans les pays du Sud, la consommation croissante de produits laitiers entraîne une augmentation des importations. La production laitière devient un enjeu économique dans le développement territorial. Pour offrir leurs compétences dans ce domaine, des chercheurs du Cirad, de disciplines diverses et appartenant à plusieurs programmes, ont constitué un groupe de travail, Laitrop. Ses objectifs sont d'évaluer les potentialités des filières existantes, d'intensifier la production laitière en améliorant l'alimentation et la santé des animaux, d'identifier les risques associés à la production, au transport et à la transformation des produits laitiers, de rechercher des processus de transformation et de conservation qui assurent la qualité des produits, d'adapter les technologies aux contextes locaux, de modéliser les performances économiques des exploitations et de la filière.

les objets d'étude et les thèmes de recherche

L'animal laitier

(vache, chèvre, brebis, chamelle, bufflesse, yack)
Adaptabilité génétique, nutritionnelle et métabolique des animaux laitiers au contexte tropical.
Evaluation et amélioration du potentiel laitier.
Techniques d'élevage (alimentation, reproduction, protection sanitaire).

Le lait

Qualité microbiologique à la production et au cours du transport.
Procédés chimiques et physiques de stabilisation.
Connaissance des produits traditionnels.
Technologie fromagère.

Produits laitiers au bazar d'Almaty, Kazakhstan

L'exploitation laitière

Développement des cultures fourragères.
Amélioration des systèmes d'alimentation.
Evaluation des performances de production des exploitations laitières.
Modélisation économique.
Analyse des facteurs de risque sanitaire, écopathologie.
Déterminants socio-économiques de la production laitière.

Laiterie dans le désert du Néguev, Israël

La filière du lait

Compétitivité de la filière du lait.
Appui aux organisations de producteurs, aux minilaiteries, aux acteurs de la filière.
Etude de l'intégration territoriale.
Analyse des évolutions de la demande urbaine.
Adaptation des réglementations publiques de la qualité.
Privatisation des services d'appui.

des savoir-faire dans plusieurs disciplines

Taurins Kouri, animaux laitiers du lac Tchad

Cultures fourragères intensives en Thaïlande

Zootechnie : évaluer les performances de production et les pratiques d'élevage et de traite.

Génétique : améliorer le potentiel laitier des espèces tropicales et adapter des races exotiques ; caractériser des QTL laitiers des espèces laitières en élevage périurbain.

Agronomie des fourrages : améliorer des techniques de production et intégrer des fourrages dans les exploitations mixtes agriculture-élevage.

Alimentation : lever les contraintes alimentaires à la production et analyse de la qualité.

Ecopathologie et santé animale : identifier des facteurs de risque sanitaire et lutter contre les principales maladies.

Epidémiologie et santé publique : garantir la sécurité des produits consommés par l'homme.

Technologie : améliorer les procédés de transformation et de conservation.

Socio-économie : évaluer les performances sociales et économiques des exploitations et de la filière ; proposer des conseils de gestion aux exploitations ; étudier les pratiques de consommation et les stratégies commerciales.

Biométrie : modéliser les performances zootechniques et économiques des exploitations laitières.

Barattage traditionnel chez les Peuls, Niger

plusieurs programmes impliqués

Programme productions animales (Cirad-emvt) : de la production à la filière

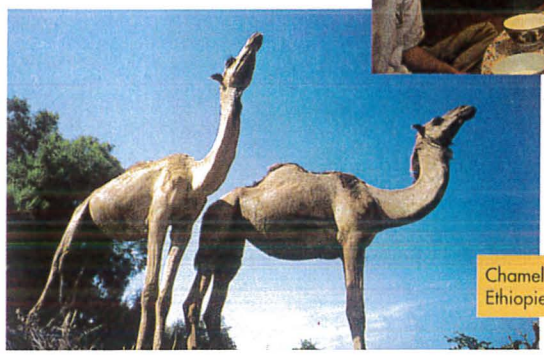
Programme santé animale (Cirad-emvt) : la lutte contre les maladies

Programme agroalimentaire (Cirad-amis) : de la transformation à la conservation

Programme agricultures familiales (Cirad-tera) : le développement territorial

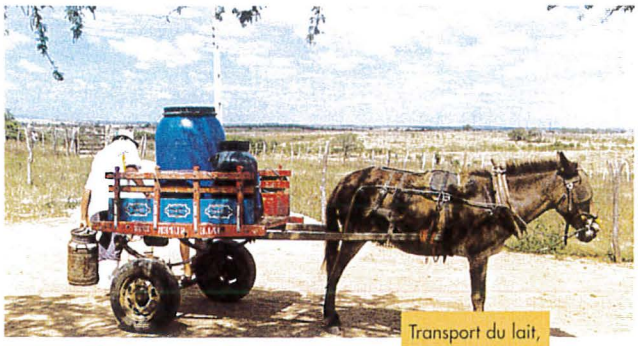
Sur le marché de Gouzé, RCA

Dégustation de *koumiss*, lait de jument, Kazakhstan

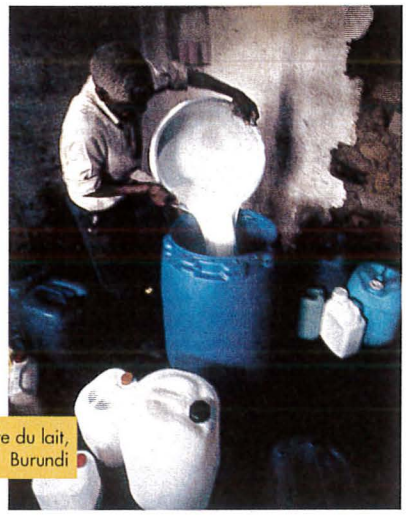


Chamelle laitière, Ethiopie

des projets



Transport du lait, Pérou



Collecte du lait, Burundi

Le lait « bicyclette », Inde

Zébu laitier *(laï sindh)*, Vietman

Brésil. Innovations et construction de la qualité dans les fromageries artisanales du Sergipe ; appui à l'amélioration de la qualité sanitaire des fromages du Nordeste ; qualité microbiologique des produits ; gestion des systèmes prairiaux amazoniens.

Pérou. Appui au développement territorial dans le bassin laitier de Cajamarca.

Burundi. Appui à l'amélioration de la production laitière dans le projet Mugamba-Nord.

Éthiopie. Analyse des systèmes de santé dans la filière du lait périurbaine d'Addis-Abeba.

Mali. Appui à des groupements de producteurs en système irrigué.

Maroc. Analyse économique des élevages laitiers camelins périurbains dans les provinces sahariennes de Laâyoune, Boujdoor et Dahla.

Sénégal. Diagnostic et amélioration de la production de lait à partir de bovins métis dans les zones arachidières, cotonnières et irriguées. Etude de l'impact des petites et moyennes entreprises de l'aval sur le développement de la production.

Ouganda. Appui au développement de la production laitière et de la qualité du lait dans le bassin laitier de Mbarara.

Tchad. Etude et appui aux filières d'approvisionnement en lait des villes des savanes cotonnières d'Afrique centrale (Prasac, pôle régional de recherche appliquée au développement des savanes d'Afrique centrale).

Réunion. Étude des facteurs de risque de l'infécondité chez les vaches laitières. Gestion raisonnée des prairies. Modélisation économique des exploitations laitières. Qualité du lait.

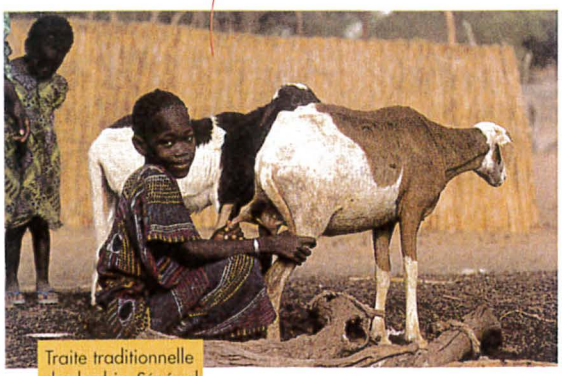
Kazakhstan. Mise en place d'une démarche qualité des produits laitiers traditionnels *(koumiss, shubat)*.

Vietnam. Développement de bassin de production laitière pour l'approvisionnement des villes.

des partenaires multiples

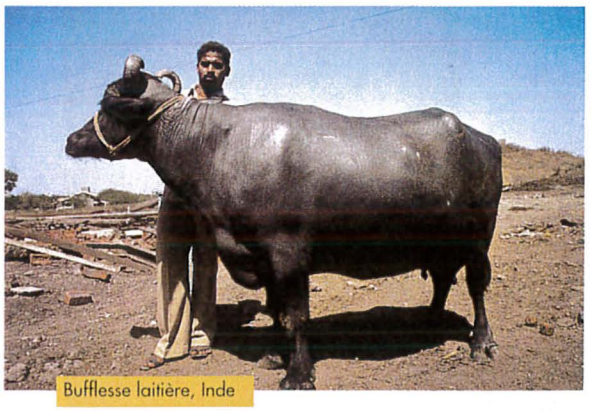
Inra, Ird, Afssa, Ilri (International Livestock Research Institute, Ethiopie), collectivités territoriales, agences de développement, organisations non gouvernementales, industriels laitiers, universités du Sud, services de l'élevage des pays du Sud, etc.

Laitrop dans le monde



Traite traditionnelle des brebis, Sénégal

Les soins à la mamelle, Tchad



Bufflesse laitière, Inde

Laitrop en bref

15 chercheurs de 4 programmes dont 9 outre-mer (Brésil, Sénégal, Ethiopie, Inde, Madagascar, Réunion).
De nouveaux projets en Ouganda, au Vietnam, en Thaïlande et au Kazakhstan.
Des équipements de laboratoire.
Un appui en gestion et traitement des données.
Un forum électronique : laitrop@cirad.fr

Coordinateur

B. Faye, programme productions animales (Cirad-emvt)

Contacts

Ph. Lecomte, programme productions animales (Cirad-emvt)
E. Camus et J.C. Maillard, programme santé animale (Cirad-emvt)
G. Loiseau et D. Montet, Programme agroalimentaire (Cirad-amis)
D. Deybe, programme économie, politiques et marchés (Cirad-amis)
D. Sautier et C. Cerdan, programme agricultures familiales (Cirad-tera)

Cirad-emvt : département d'élevage et de médecine vétérinaire
Cirad-amis : département d'amélioration des méthodes pour l'innovation scientifique
Cirad-tera : département territoires, environnement et acteurs

Ouvrages de référence

Elevage de la vache laitière en zone tropicale, Ch. Meyer, J.P. Denis, 1999. Cirad, Montpellier, France.
Dromadaires et chameaux, animaux laitiers. Actes du colloque de Nouakchott, oct. 1994, Cirad, Montpellier, France.
Marchés urbains et développement laitier. Actes de l'atelier de Montpellier, sept. 1998, Cirad, Montpellier, France (à paraître).

Centre de coopération internationale en recherche agronomique pour le développement

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TA 30 / A
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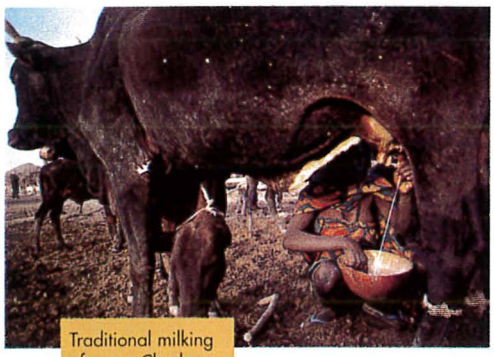
télécopie : 33 (0)4 67 59 38 25
ppa@cirad.fr

Conception : Cirad-dist Photos : B. Faye, G. Roberge, P. Lhoste

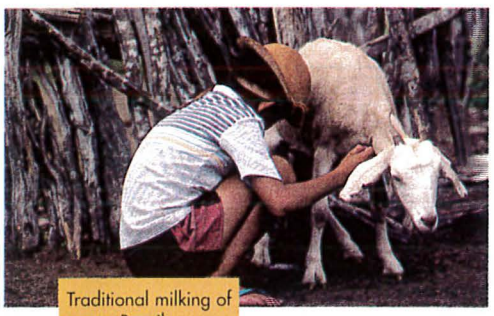
Milk, a growing industry in developing countries

Laitrop

The milk subsector at CIRAD



Traditional milking of cows, Chad



Traditional milking of goats, Brazil

In view of the economic changes in developing countries, decision-makers are reconsidering the prospects for milk production, in the face of increasing imports and local consumption. To satisfy such growing demand, it is necessary to assess the potential and the impact of the milk subsector on national development, reduce health and feeding constraints in dairy stock, improve milk production, identify the risks associated with the production, transport and processing of milk products, develop processes for improving milk product quality, adapt technologies to local situations, and model the economic performance of dairy farms and of the milk commodity channel.

Such are the aims of the LAITROP group, which encompasses several CIRAD research programmes.

Research Topics

Dairy animals

(cow, camel, goat, ewe, buffalo, yak)
Genetic, nutritional and metabolic adaptability of dairy animals to the Tropics
Assessment and improvement of milk potential
Breeding and farming techniques (feeding, reproduction, healthcare)

Milk

Microbial quality during production, transport and storage
Chemical and physical stabilization processes
Knowledge of traditional products
Cheese technology

Traditional dairy products at the Almaty bazaar, Kazakhstan

Dairy farms

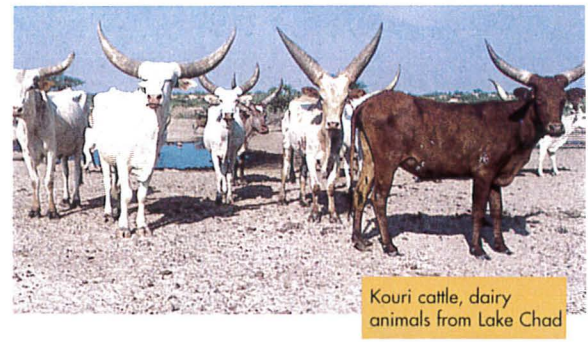
Development of fodder crops
Improvement of feeding systems
Assessment of dairy farm productivity
Economic modelling
Risk factor analysis (ecopathology)
Socioeconomic determinants of milk production

Dairy plant in the Negev desert, Israel

The milk subsector

Competitiveness of the milk commodity channel
Support of producer organizations, small and medium-sized dairy plants and industry boards
Study of territorial integration
Analysis of changes in urban demand
Adaptation of public legislation on quality and food safety
Privatization of support services

Wide-ranging know-how



Kouri cattle, dairy animals from Lake Chad

Intensive fodder crops, Thailand

Animal husbandry: assessment of production performance, breeding and milking practices

Genetics: improvement of milk potential in tropical species and adaptation of exotic breeds

Fodder crop agronomy: improvement of production techniques and inclusion in mixed farming systems

Nutrition: alleviation of feeding constraints on milk production, and quality analysis

Ecopathology and animal health: identification of risk factors and control of major dairy animal diseases

Epidemiology and public health: ensuring the safety of products intended for human consumption

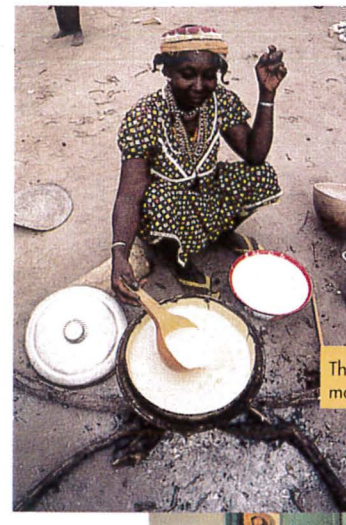
Technology: improvement of milk processing and preservation

Socioeconomics: assessment of the social and economic performance of dairy farms and of the milk subsector; management support for dairy farms; consumer behaviour and marketing strategy

Biometrics: modelling of the zootechnic and economic performance of dairy farms

Traditional churning by Fulas, Niger

Involving several programmes



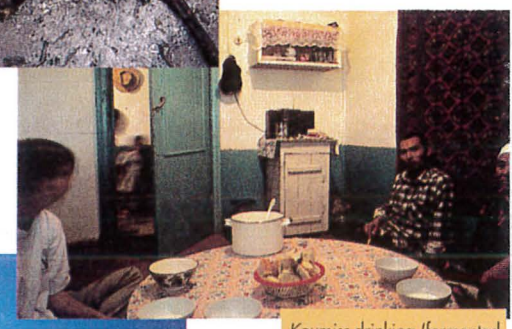
The Gouzé milk market, CAR

Animal Production Programme (CIRAD-EMVT): from production to the commodity channel

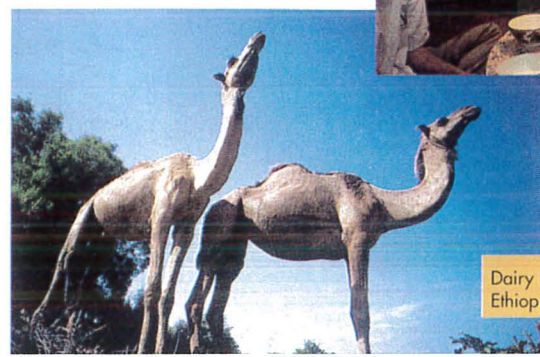
Animal Health Programme (CIRAD-EMVT): disease control

Agrifood Systems Programme and Economics, Policies and Markets Programme (CIRAD-AMIS): from processing to storage

Family Agriculture Programme (CIRAD-TERA): local development



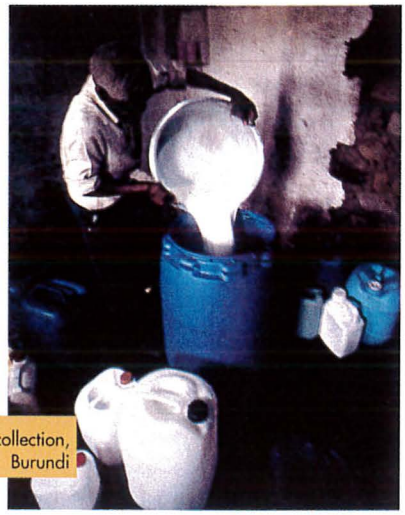
Koumiss drinking (fermented horse milk) from Kazakhstan



Dairy cattle, Ethiopia

Ongoing and future projects

Milk carrying, Peru



Milk collection, Burundi

Brazil: Innovation and quality improvement in small cheese factories in Sergipe (Nordeste); support for improving the hygienic quality of cheese in Nordeste; product microbiological quality; grassland system management in the Amazon Basin

Peru: Support for territorial development in the Cajamarca milk basin

Burundi: Support for the improvement of milk production in the Mugamba-Nord project area

Chad: Study and support of milk suppliers in towns in the savannah zone (PRASAC)

Ethiopia: Analysis of the healthcare system in the Ethiopian milk subsector

Mali: Support of milk producers' associations in irrigated systems

Morocco: Economic analysis of peri-urban dairy camel farms in the Saharan provinces

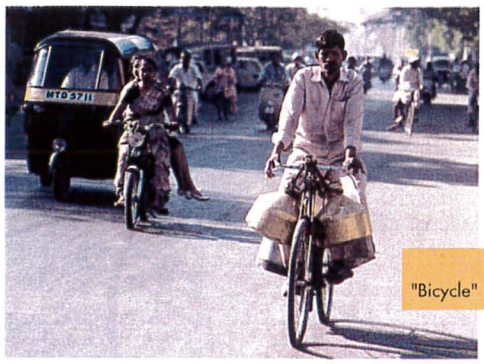
Senegal: Diagnosis and improvement of milk production using crossbreeds in groundnut, cotton or irrigated areas. Study of the impact of small and medium-sized dairy plants on production development

Uganda: Support for the development of milk production and milk quality in the Mbarara Basin

Réunion: Study of the risk factors for dairy cow infertility. Grassland management. Economic modelling of dairy farms. Milk quality

Kazakhstan: Study of the processing and preservation of traditional milk products

Vietnam: Development of milk production in the dairy basins of North and South Vietnam

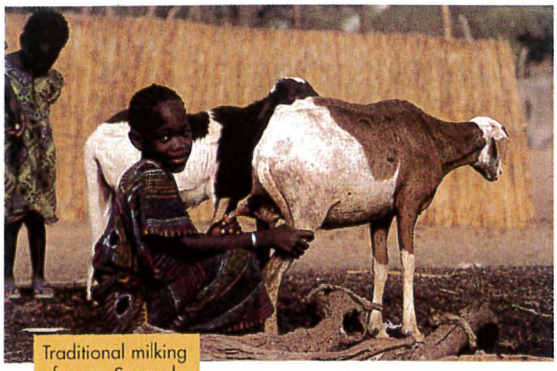


"Bicycle" milk, India

Pooling knowledge

Dairy zebu (lai Sindh), Vietnam

INRA, IRD, AFSSA (France); ILRI (Ethopia); local organizations development agencies; non-governmental organizations; the milk industry; universities in developing countries; livestock services in developing countries, etc.



Traditional milking of ewes, Senegal

Laitrop worldwide

Udder care in goats, Chad

Dairy buffalo, India

Laitrop at a glance

15 scientist from 4 programmes, 9 of them working overseas (Brazil, Chad, Ethiopia, Madagascar, India, Senegal, Réunion).
New projects in Vietnam, Thailand, Uganda and Kazakhstan.
Fully equiped laboratories.
Support facilities for management and data analysis.
An electonic forum: laitrop@cirad.fr

Coordinator:
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D. Sautier and C. Cerdan, Family Agriculture Programme (CIRAD-TERA)

Cirad-emvt : department of Animal production and veterinary medicine
Cirad-amis : department of Advanced methods for innovation in Science
Cirad-tera : department of Territories, environment and people

Some bibliographical references:

Elevage de la vache laitière en zone tropicale. Ch. Meyer, J.P. Denis, 1999. CIRAD, Montpellier, France
Dromadaires et chameaux, animaux laitiers. P. Bonnet. Actes du colloque de Nouakchott, Oct. 1994. CIRAD, Montpellier, France
Marchés urbains et développement laitier. Actes de l'atelier de Montpellier, Sept. 1998. CIRAD Montpellier, France
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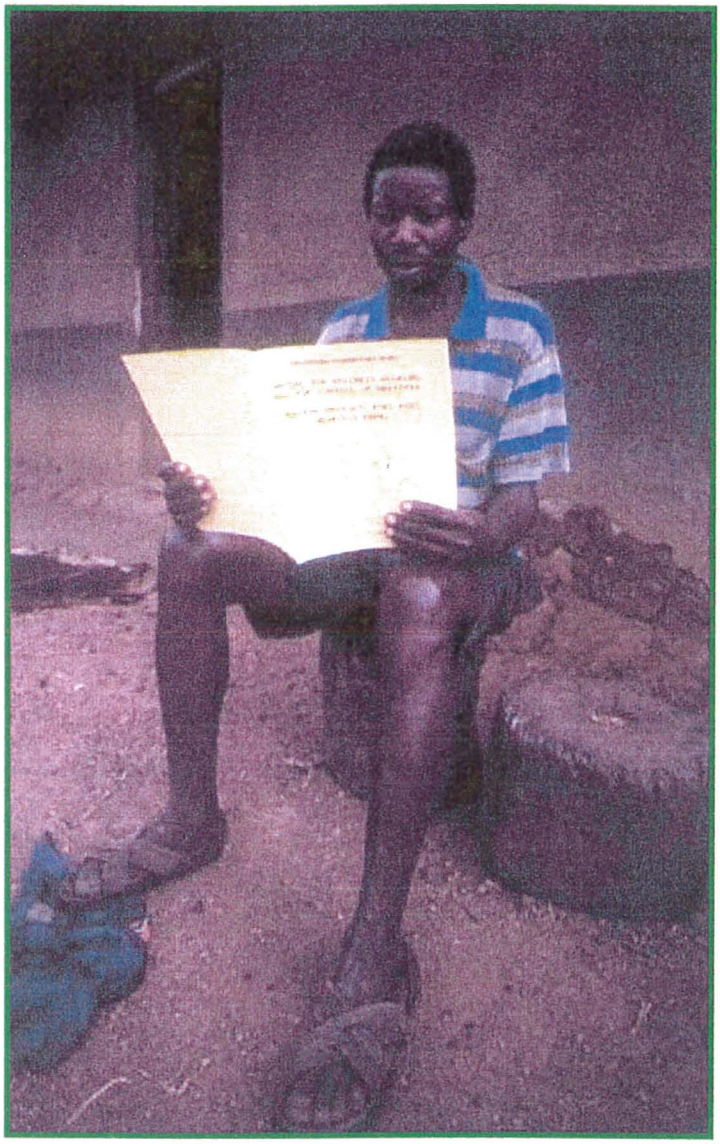
ANNEXE 10

Quelques photos...

Intradermo-tuberculinatin

Séance de sensibilitation



Lecture attentive de la brochure sur l'hygiène de la traite et le contrôle des mammites